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Paper Ruling



By JOHN J. PLEGER

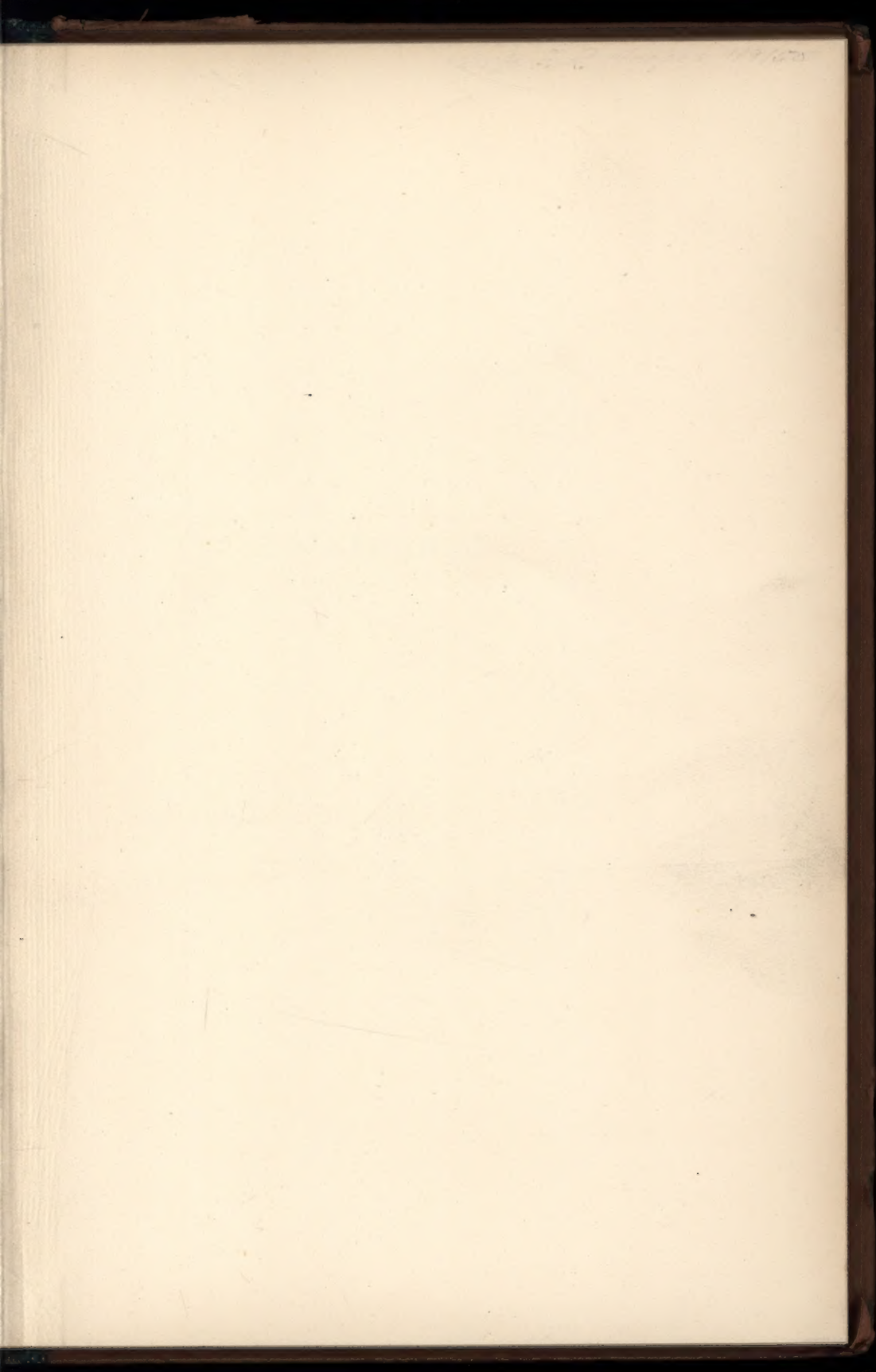
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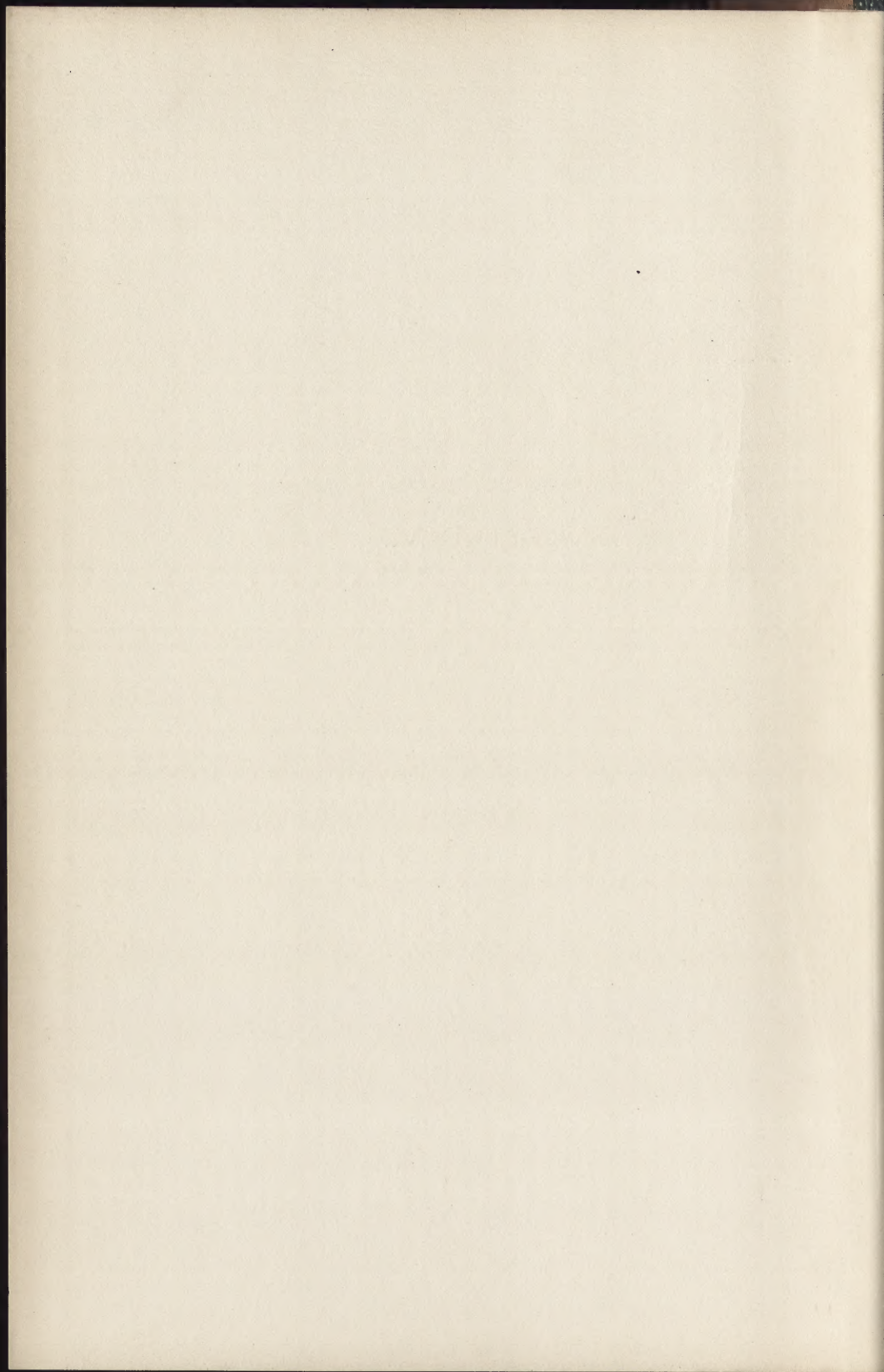
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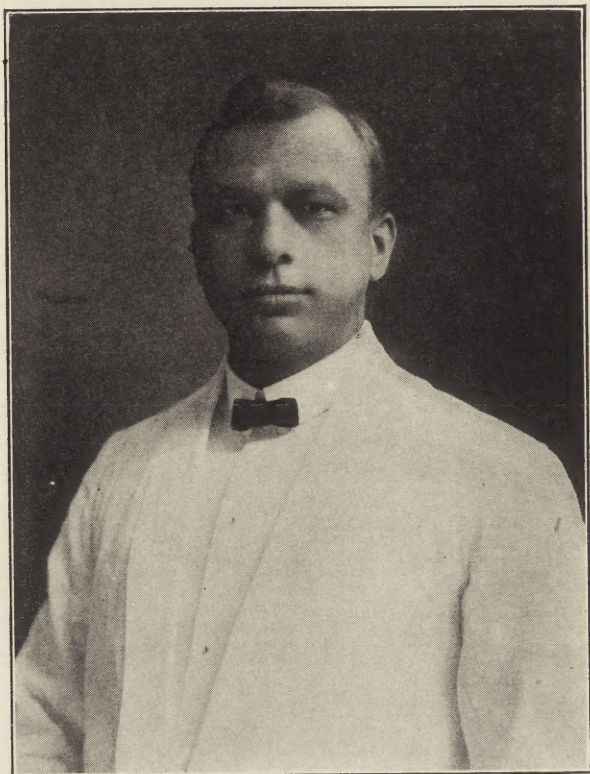
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BOOKBINDING



JOHN J. PLEGER.

BOOKBINDING
AND
ITS AUXILIARY BRANCHES
(IN FOUR PARTS)

BY
JOHN J. PLEGER

PART ONE

PAPER RULING

FRANKLIN INSTITUTE
PHILADELPHIA

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FOREWORD

It is not laudation of any trade to say that it follows in a beaten path when there is no reason therefor except that methods of procedure are habitual. That the present-day craftsman leaves too much to precedent and habit, and does not exercise enough his power of initiative, is demonstrated clearly by experience in paper ruling. To improve ought to be the constant aim: to do this, the continuation of steadfast methods and styles must be merited by sufficient reasons.

The invention of machinery has given impetus to all branches of manufacturing, and, by the displacement of hand labor, has given a possibility for further development of modern methods, yet we find there is in many ruling rooms labor performed by hand which, with a proper understanding of hand and machine methods, might be done more expeditiously and perfectly with machines. Modern conditions and demands, however, are not an unmitigated advance; coupled with the opportunity for improved methods have come the pressure of competition and the slipshod makeshifts to economize in material and time without regard to the fineness or durability of the product. "Art with cheapness" was the motto of the ancient Greek, and it would be well for the modern man also to adopt that slogan. Cheapness, in contrast to extravagance, is meant, not to be confused with shoddiness. The Greek believed, as we should, that simplicity and plain durability were the methods of attainment.

So, changes in, as well as continuation of, methods and styles of paper ruling must be merited by sufficient reasons. The terms of paper ruling are sometimes technical, but at other times are local or accidental. To have

terms of value it is necessary to make them universal, so that a science may be based upon them, and one man may profit by the experience of another. It may seem strange, yet it nevertheless is true, that terms are at variance in different localities, and there seems to be no harmonious plan of description.

A demand has arisen for a book for use as a text. The growing generation is composed of students, and there is a demand not only for advanced knowledge among those practicing the art but among many would-be learners for a school, and, more essential still, a text. Craft education is of importance in these days of appreciated handiwork; moreover, among those whose livelihood is earned by such labor, competition is so keen that each laborer must needs strive to perfect himself in order to obtain the rewards of success.

It has been my aim in compiling these pages to treat the subject in a concise and comprehensive manner, defining consistently terms and processes in a way which may be grasped by novices and serve as an aid to bookbinders, librarians, and printers who are more or less in charge of office work. To instruct the paper ruler, printer and binder, serve as a court of appeal for the man in the ruling room when he should question erroneous work orders, and to aid both in satisfying the requisitioner, these pages are written.

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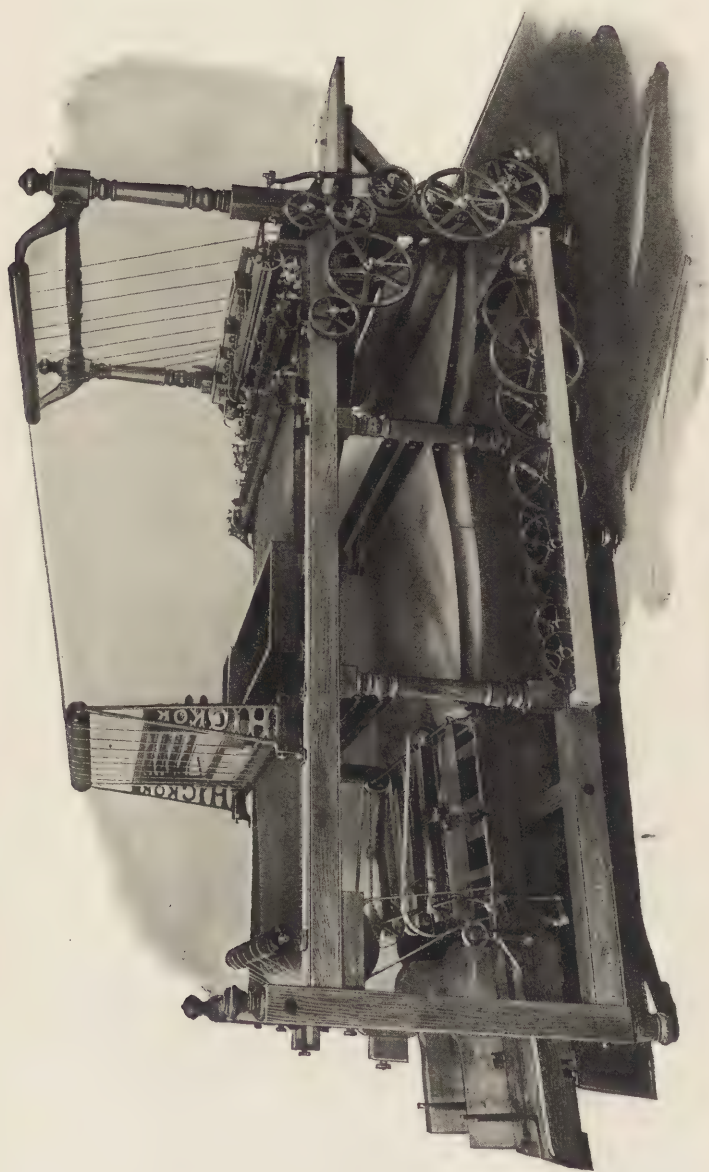
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RULING.

PEN RULING MACHINE.

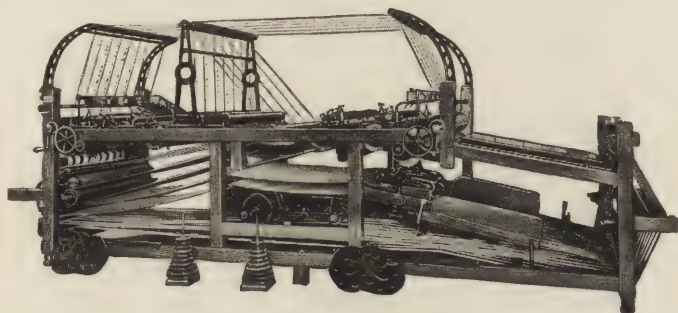
DOUBLE OR TRIPLE BEAMS WITH STRIKER.—The pen ruling machine is considered the simplest and most adapted to the requirements of ruling blanks and account books. Since the invention of the Gouptell striker, which was purchased and used by the Hickok Company on its machines, improvements have been made, but none which affect the general design and principle. The mechanical principle could be changed for the better, because a perfect register, such as is possible on the printing-press, can only be had under favorable conditions. The printing-press grips the paper and holds it to the cylinder, thus tending toward accuracy, while in ruling the paper is held to the blanket only by cords. The blanket is influenced by the atmosphere, and vigilance on the part of the ruler is required to prevent a snake-like motion while the machine is running. A complicated pattern which necessitates feeding the sheet through the machine a number of times will, under such conditions, be difficult to register. In many localities the movement of the blanket over the segment board causes the blanket to be charged with electricity, which draws the ink from the pens and gives blots as a result.

Accurate striking with the second or third beams is difficult on curled or wrinkled paper. In ruling a job having a heavy unit pattern on one-half of the sheet and few lines on the other half, the progress of the sheet will be retarded on the half which has the heavy unit ruling, because of the uncounterbalanced weight of the pens. The remedies for these defects have been fully described under the different heads.



W. O. Hickok Co., Harrisburg, Pa.

DOUBLE RULING MACHINE.—These machines are designed to rule two sides with but one feed. They will rule straight lines or strike on both sides. Any establishment doing a large amount of straight work can ill afford to do such work on the ordinary machine, as this style saves one-half of the labor in the operation.



Dewey Ruling Machine, Springfield, Mass.

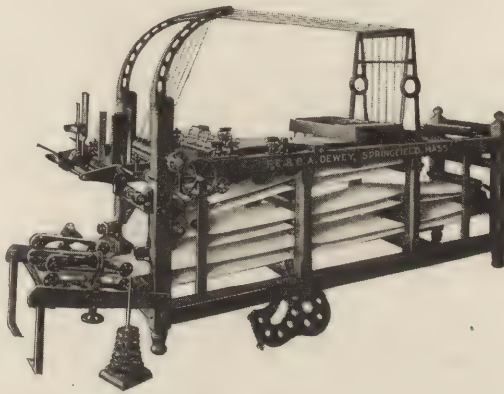
DUAL "L" RULING MACHINE.—The dual "L" ruling machine is designed to meet the wants of the factory in which a great deal of stock, such as bill-heads, etc., is done, which requires down-lining and cross-lining on one side. The machine is very speedy, and at one feeding both cross-lines and down-lines are ruled. They are carefully designed with a view to accuracy, and are provided with mechanism for changing the direction of the paper from the first to the second machine, and with the automatic straightening device with which all these machines are provided, the register is satisfactory. They are no more difficult to operate than a single machine, and any ruler can without difficulty execute fine work on them. For one-side patterns they are very economical and great time-savers. This machine can also be built of two striker machines with "L" attachment, so that it can be used as an "L" or as two single machines, as desired; when used as an "L," however, striking can not be done on both machines at one feeding.



Hickok Dual "L" Ruling Machine.

QUADRUPLE "L" RULING MACHINE.—These machines are the same in general design as the dual "L," but, in addition to the striker beam or beams on upper cloth on striker portion of the dual "L" machine, and faint-line beam or beams on the upper cloth of faint-line portion of the dual "L" machine, these styles have a striker beam or beams on the lower cloth of the striker portion of machine, and faint-line beam or beams on the lower cloth of faint-line portion of the machine, thus enabling the ruler to down-line and cross-line both sides of the paper at one feeding. They are accurate and reliable, and can be recommended for ruling stock patterns of all kinds.

DEWEY AUTOMATIC CARD-RULING MACHINE.—A speed of forty thousand cards an hour, with perfect alignment,



Automatic Card Machine.

is the guarantee made for the automatic-feed card-ruling machine shown in the accompanying illustration. This machine is for ruling index cards, both striking and faint-lining, and is so constructed that the feeder can be changed in less than one minute to feed cards from 3 inches to 12 inches in size. It can also be used as a stock machine for small paper. The feeder can readily be



Hickok Quadruple "L" Ruling Machine.

dropped down and a feed-table bar — which is supplied with the machine if required — put on and the machine fed by hand.

RULING-MACHINE PARTS.

ADJUSTABLE CORD ROLLERS.— One roller is back of the ink box to adjust the overhead cords, and one is in front of the machine to regulate the lower cords.

ADJUSTABLE STEEL GUIDE.— A piece of steel, on the edge of the guide board, adjusted with a thumbscrew to suit varying paper.

ADJUSTABLE TOE PLATE.— A piece of steel fastened with a thumbscrew under the toe of the striker pen rest. This rests on the cams and permits a quick adjustment when striking varies.

APRON.— The lower cloth which carries the sheets from the lower cords to the lay-boy or receiving box.

APRON-ADJUSTING ROLLER.— The roller under the back of the machine.

BEAM.— That part which holds the pen clamp and extension penholders.

BEAM SPRING.— Spring on the frame at the end of the beams to prevent jar to beam and staggering or quivering of pens when striking.

BEAM STANDARDS.— The stands on both ends of the beams which permit raising or lowering, and forward and backward adjustments of the beam.

BEAM WEIGHT.— A cast-iron cylinder about 2 inches long and $1\frac{1}{4}$ inches in diameter, adjusted on an arm at the end of the beam. This, together with a rubber band attached to the pen-rest arm, permits of an abrupt drop.

BLANKET.— The upper cloth which carries the sheets from the feedboard to the apron cords.

BLANKET-ADJUSTING ROLLER.— The roller in the rear of the striker shaft.

BLANKET CYLINDER.—The roller around which the upper cloth runs and by which it is driven.

BLANKET GUIDES.—Two bent rods adjusted in sockets of a roller which operates on a pivot longitudinally and vertically. The rod ends keep the cloth in position and prevent running to either side.

BLANKET STEM BOX CYLINDER.—Roller in the front of the machine; adjusted when desired to tighten or loosen blanket.

CAM HEAD.—The wheel containing two slots in which cams are inserted to lift the pens in striking.

CAMS.—Flat, curved pieces of iron which are set in the slot of the cam-head wheel to lift the beams and underlift.

CLAMP.—The part, consisting of two jaws lined with rubber, in which the pens are held by thumbscrews.

CLAMP RACK.—Receptacle, at the right of the ink box, for clamps.

CORD CYLINDER.—Grooved roller above the blanket, having a crank handle by which the machine may be operated by hand.

DOGS.—Holders on the top of the beam in which extension penholders are fastened. Holders on underlift in which spoons are fastened.

EXTENSION PENHOLDERS.—Metal holders arranged for one, two, or three colors, on the end of which there is a clamp where pens are inserted. They are clamped in the beam when used for headlines or special divisions.

EXTENSION PENHOLDER GRIPPER.—The extension penholder fastener situated on top of the beam.

FEED OR GUIDE BOARD.—A brass-edged board back of the machine on which the paper is laid and to the edge of which it is fed into the machine. Some machines have a movable feedboard which is operated on the side with a hand-wheel.

FLIP-UP.—The shoe which holds the trip finger of the gate.

IDLER OR CARRYING ROLLERS.—All small rollers which support blanket, apron, or cords; they are interchangeable.

INK FOUNTAINS.—Copper boxes with double stop-cock spouts which regulate the ink flow. They are put on a bar back of the first beam and feed the flannels with ink.

INTERMEDIATE GEAR.—The large gear connecting striker with the rest of the machine. Two other intermediate gears connect the cam-head wheels of the second and third beams.

LAY-BOY.—That part of the machine which carries, receives and jogs the sheets when ruled.

PAPER-SIZE GEARS.—Gears which are changed before striking to accommodate different sizes of paper. These are connected with the intermediate gear.

PEN CYLINDER.—A complete cylinder, or a section, under the pens over which the blanket or upper cloth runs.

PEN REST.—Arm, bearing adjustable screws, on the end of the beam. It rides on the cam in striking.

SECTIONAL CLAMP.—A clamp, containing one or two layers of hard rubber, used when pens are set closely together in down-ruling.

SEGMENT BOARD.—Board under the second-beam pens.

SPOONS.—Pieces of brass attached to iron holders; used to lift pens on underlift.

STRIKER.—The device which, when adjusted, enables the pens to drop and lift at a given line.

STRIKER GATE.—The shaft with finger blades near the first beam which holds and releases the sheets at intervals.

TRIP FINGER.—The steel finger, set in a holder on the

gate shaft, which runs on a cam and allows the gate to lift when it reaches an opening in the wheel.

UNDERLIFT.—The steel clamp under the first beam in which small pieces of tin or brass, or adjustable spoons on other style machines, are placed to lift the pens.

RULING TERMS.

BOX-HEAD.—A box-head consists of two horizontal and two perpendicular lines.

FOOT-TOTALS.—Single or double lines at the bottom of the sheet. These are usually ruled in red.

HEAD-LINES.—Lines ruled in two or three colors made by triple or quadruple pens about $1\frac{1}{2}$ inches from the top edge of the sheet.

INTERLINES.—Faint lines ruled between horizontal lines, starting and lifting on the sheet as desired.

LAPPING SHEETS.—Sheets fed on top of each other in striking.

PLY-BACK.—Two or more thicknesses of metal in the shank of a pen.

PUMPING.—The working-up of colors into the shank of two or three ply-back pens.

REGISTER.—A sheet is said to register when ruled on both sides so that when the sheet is held to the light the lines exactly coincide.

RUNNING BLIND.—When double or triple pens run together and rule a wide line.

SLIP-LOOP.—Made by two ends of zephyr brought together, then looped by bringing the folded end over about 1 inch. The pen is put in the loop and the zephyr tightened.

SMEARING.—The rubbing of sheets upon each other when dropping in the lay-boy while the ink is not dry.

SPRINGING PENS.—Pens which are set for striking from two heads in one beam, both lifting at a foot-line;

the longer pens are set lower and a small cam is used, thus enabling the longer pens to drag until the final lift.

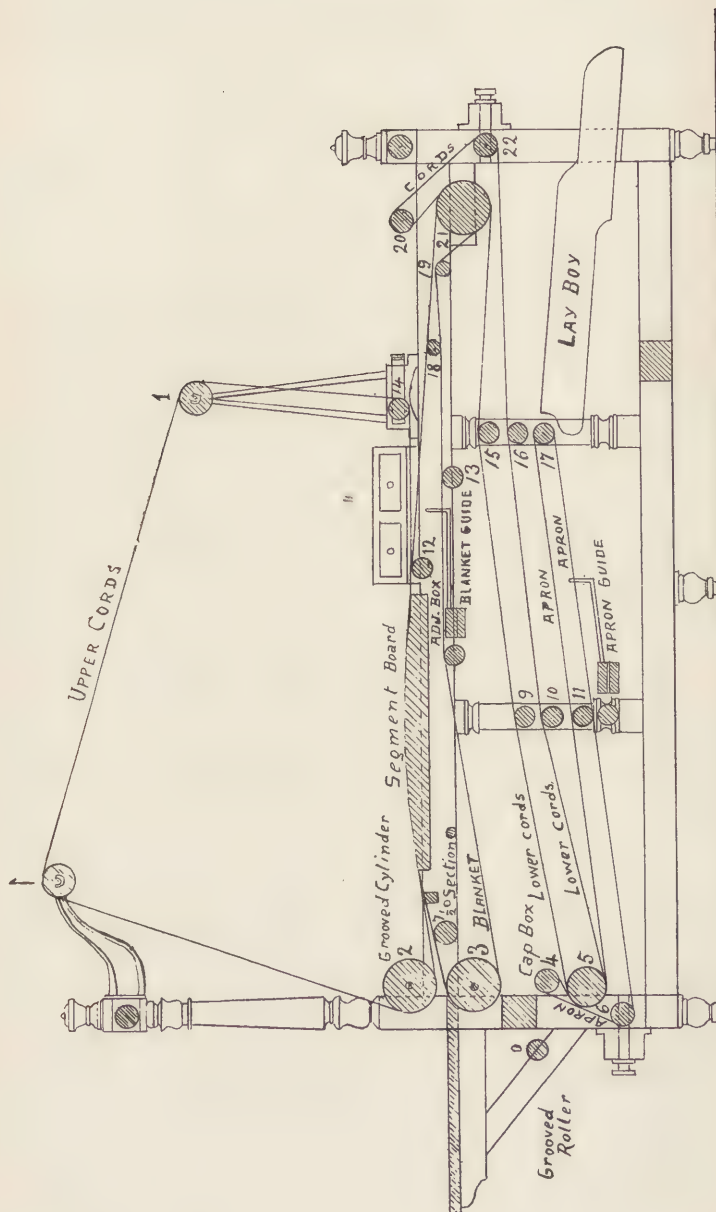
STAGGERING.—The vacillation of the pen when striking.

SUB-HEAD.—A line printed or ruled in a box-head, above which the general head is printed.

SETTING UP A PEN RULING MACHINE.

The setting up of a ruling machine is a matter of vital importance, for unless care is taken to fit the parts in a way which will assure the smooth, easy running of the machine, register is impossible. Such difficulties can be obviated by fitting the parts as indicated by the manufacturer's numbers.

All joining parts, rollers, cylinders are stamped with numbers and corresponding numbers appear on the bearings in which they belong, except the idler or carrier rollers, which are interchangeable. Put the sides of the frame in position with the cross pieces and end frame inserted. Then place the lay-boy or receiving box in position and screw to the sides under the apron roller. Place the striker shaft, blanket roller, pen cylinder, and segment board, blanket-supporting and blanket-adjusting rollers between the blanket and then into their respective sockets. Next put the supporting rollers and the adjusting apron roller between the apron and then into their respective sockets. Then place the lower cord roller on top of the apron and place in its socket near the adjusting roller. The striker gate, the ink box, the overhead cord rollers, the other apron or the lower cord rollers, are put in their respective sockets and the bolts of the frame and all adjusting rollers tightened. The guide board is then screwed to the brackets and the feedboard adjusted thereon. Next level the machine with a spirit level on top of the side rails and cross pieces. Then take a carpenter's square and try the machine at the four



- 1 — Upper cord rollers. 2 — Cord cylinder. 3 — Blanket cylinder. 4 — Apron supporting roller.
 5 — Lower cord roller. 6 — Apron-adjusting roller. 7 — Blanket-adjusting roller. 9, 10, 11, 12,
 13, 15, 16, 17, 18, 19 — Carrying or supporting rollers. 14 — Upper cord-adjusting roller. 20 —
 Grooved roller. 21 — Blanket-stem box cylinder. 22 — Lower cords adjusting roller.

corners. The sides must be at a perfect right angle to the ends. If there is a decided leaning to one side or the other, put a piece of board under the frame until a perfectly level surface is obtained. Should the machine, after being oiled, run hard, loosen the bolts of the frame a trifle. If the machine happens to be a misfit, it may be necessary to insert a thin piece of strawboard into the frame before tightening.

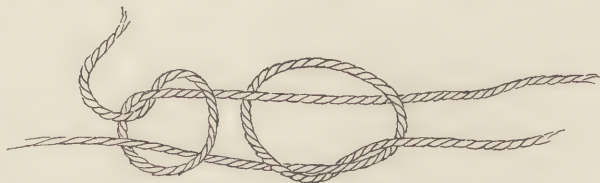
The blanket runs around the blanket cylinder to which there is a crank-handle attached, blanket-adjusting roller, pen cylinder, segment board, three blanket-supporting rollers and blanket-stem box cylinder. It then travels upward over one carrying roller (which should be covered with blotting paper), one supporting roller and one blanket-guide roller, then over another supporting roller and back to the blanket cylinder. The apron runs around a supporting roller elevated above the course of the apron; then down, passing the lower cord cylinder, over one supporting roller, around a roller close to the lay-boy, then back around the adjusting roller. On some machines there are apron-guide rollers which greatly facilitate the running of the apron; it passes over the roller in the center below a supporting roller.

BLANKET.—The blanket, when once adjusted for ruling, should not be tampered with, as bad registering will invariably result. If cloth guides barely touch, play being given according to the irregularity of the edges, if the adjusting roller is set even and not too tight, if the machine is level and at right angles, it should be left alone. Should the blanket run to one side, do not pull it with any great force, but start the power, tighten the adjusting roller on the end toward which it runs, and work it over gradually. Pulling the blanket will stretch it and cause no end of trouble. If the blanket gets damp, do not allow the machine to stand still, but keep the rollers turning, as its passage over them tends

to prevent warping. The screws should be loosened in damp weather to bring the blanket to its normal tension and tightened again in dry weather. All ruling blankets ought to be cleaned once a week, as dust will accumulate on them. To remove the accumulation, hold a short bristle brush to the blanket beneath the feed-board while the machine is running until the entire width of the machine is dusted. The washing of the blanket can be done by any first-class laundry, with instructions not to stretch it and to avoid the use of chloride of lime or soap, as both resist ink. It may be washed on the machine by a mixture consisting of two quarts of water, one pint of ammonia, one pint of prepared ox gall, and a little washing soda. With a stubby brush rub the cloth, and turn gradually; do not tighten or loosen the cloth, but leave the adjusting screws in the same position. It is essential that the cloth dries evenly at both ends; hence care must be taken to have the adjusting rollers straight. Gasoline also may be used as a cleanser. Any blanket which, when the pens strike it, deadens the ink so that it is barely visible in streaks on the next sheet, should be washed as above described. If then the same trouble occurs, the best and the cheapest remedy is to purchase a new blanket.

CORDS.—For the overhead cords use thin linen 25 3/c thread. When tying, glue the ends down to avoid the raising of the pens when the knots pass between seven, eight or nine point pens. In putting the cords on the machine, care must be taken that all are of the same tension. Loose cords will draw the paper to one side. The distance between the overhead cords should be approximately 1 inch. The overhead or upper cords should run around the grooved cylinder in the back, along the top of the blanket, around the adjustable roller, around the two top idlers or carrying rollers, and be tied at the grooved roller. All idler or carrying rollers that come in contact with the working side of the

blanket, as well as all rollers that support the lower cords, should be covered with thin blotting paper. For the lower cords heavy linen 16 4/c or cotton thread can be used. The opinion prevails that the climatic changes of some localities make the use of cotton thread imperative, as it expands and contracts with changes in the



A Method of Tying Cord.

atmosphere. The lower cords should be about 2 inches apart. They should run around the grooved roller in front of the machine, around the stem-box cylinder, over the two top idler or carrier rollers, around the apron cylinder, on the top of the two idler or carrier rollers, then around the adjusting roller, where the knot is tied.

STRIKER.—The striker is the device which, when adjusted, enables the pens to drop and lift at desired lengths. It is a gate, an iron rod with finger blades near the first beam. When connected with gears at the side of the machine, it rises at intervals to release the paper. The cam wheel is on the right (as the sheet passes in) of the machine, and consists of two slots which are filled with cams to raise the pens where ruling is not desired. A double-beam machine has two such wheels; and a triple-beam, three. Triple beams are made when requested, but unless there be a special reason for such a machine the double beam with an underlift fills the present demands and does the work better. The intermediate gear, when connected with the sheet gear for striking, should neither bind nor have too much play; a binding of the cog wheels will cause vibration, while too much play will vary the drops and lifts of the beam.

THE GATE.—The gate must be adjusted in a manner which will prevent the sheet from sliding under; that is, even on both ends with but little pressure on the blanket. A gate which is unevenly adjusted will draw the paper to the tight side, and accuracy in striking is impossible. If the finger blades of the gate are pressing too deeply into the blanket or not touching it, release the screw which binds the trip finger to the gate rod. Move it up or down as required, and tighten the screw. Set the sharp edge of the trip finger against the gate cam, and not the smooth rounded side, as a higher and quicker lift results. Should it be necessary to lower the finger blades of the gate to prevent the lifting of it too high, release the screw of the casting, which strikes the rubber buffer, and lower it. Heavy bearing of the gate on the paper compels loose cords, and a light bearing tight cords; the latter is at all times preferable to assure register, especially on the second beam. Strong tension of the gate spring is not desirable. Some machines work well with the gate upright. Others work better with the gate at an angle. The latter shortens the lift and is preferable. All rulers should use extra precautions when taking over a strange machine to see that the gate is straight the entire length. Sometimes the gate is uneven, due, perhaps, to the former ruler's violent temper in tearing out sheets which were caught.

An improvement on the present striker gate would be to have adjustable finger blades so that the gate would hold the paper in the center only. This would help materially in striking the down lines on sheets which are not entirely square. With such arrangement the sheets, when coming in contact with the striker gate, would neither crowd nor leave it.

If the gate holds the paper too long, which is invariably the case when feeding the sheets on top of each other, the bottom sheet gets the benefit of the moving blanket, and is held back so that accurate striking is impossible.

The paper should be fed without lapping whenever possible, especially when the blanket is soiled.

PAPER-SIZE GEARS.—Gears are furnished for the different sizes of paper; the smaller the gear wheel, the smaller the size of the sheet it will take. The sizes are as follows: 14, 16, 17, 18, 19, 22, 24, 28, 32, 36, 43 and 49. The figures denote the size of the paper in inches in each case, and leave a small space between the sheets when ruling. These are adjusted on the machine and connected with the drive gear by the intermediate gear.

Sometimes it is necessary to strike sheets smaller than 14-inch paper, the size taken by the spacing of the smallest change-gear. For example, take a sheet 7 inches long. Place the 14-inch gear on the end of the pencil-cylinder shaft and lock into place, as for striking a 14-inch sheet of paper. Loosen the flip-up, which holds the trip finger and is on the end of the gate bar opposite the ruler. Move the flip-up until the trip finger rests or rides on the double-wing gate cam, instead of the single-wing cam. These two cams are situated on the opposite side of the machine from the ruler and are side by side on the same stud. Tighten the flip-up; the gate will lift twice to one revolution of the 14-inch gear, and will space 7-inch paper for striking. Eleven-inch paper can be spaced with the 22-inch gear when the double-wing cam is used. Other lengths can be spaced in the same manner.

If a grinding noise is heard, the gears are meshed too tightly; then lower the intermediate gear a trifle, just enough to stop the grinding. Do not mesh the gears too loosely, as back-lash will result, which will spoil the striking.

CARE OF MACHINE.

All new machines should run a few days with a slack blanket and apron, and be oiled twice a day. This is done for all parts to find their bearings. To keep the machine in good running condition, put a drop of oil in

each socket once a day, and clean the sockets with naphtha at least three times a year. Too much oil in the sockets will work out on the rollers, saturate the cords or strings, and soil the paper. Thumbscrews were made to tighten with the hand and not with a wrench. Using a wrench will split the clamp.

The sun should not be permitted to shine on the machine, as it might warp the rollers and contract the blanket. If cloth runs to either side, adjust it by tightening the end to which it runs. Belts must be tight, and the apron or lower cloth loose enough to prevent the cord from indenting the paper. Rollers over which the ruled paper passes must be covered with blotting paper to prevent smearing; it should be renewed three or four times a year.

When the ruling machine is not in use, cover the blanket and ink bowls. A fixed rule in all establishments should be to cover the machine overnight. This will prevent dust from settling on the blanket and in the ink bowls.

RULING-MACHINE ACCESSORIES.

PENS.—There are one, two and three ply-back pens in the market, and rulers often have a decided preference for one or the other of them. Ply-back denotes the thickness of metal in the shank of the pens. Two or three ply-back pens are to-day obsolescent. When using two or three colors of inks, the colors work up into the shank between the thicknesses of metal, thus running together and causing delay in resetting the pattern. Two-ply-back pens are not satisfactory for striking, as the shank is not solid enough to prevent staggering. Three-ply-back pens have the solidity in the shank for striking, but are objectionable because of the ink working up between the thicknesses of metal in the shank of the pens. One-ply-back pens are of the same thickness of metal throughout, and give greater satisfaction than the two or three ply-back pens. Pumping on one-ply pens is entirely elimi-

nated because of the impossibility of the colors working up into the shank and running together. Two-ply and three-ply-back pens set in the same clamp will not give satisfaction because it is impossible to clasp the two thicknesses with equal firmness. The toes and heels of all new horizontal and perpendicular pens should be filed by drawing across a flat sheet of No. 00 emery paper. This will facilitate smooth running and prevent broken lines.

FAINT-LINE OR HORIZONTAL PENS.—These pens are made on the point system. They are superior to the old style, which were gauged by the fraction of an inch. The point being the printers' unit of measurement makes the system desirable in all printed forms. It also obviates the use of paper and board in setting type for box-heads. These pens are manufactured in bars about $4\frac{1}{2}$ inches long. To be convenient in making ready, some of these are cut up into halves or thirds. Pens should not be bent or spread from a narrow to a wider point, as it is cheaper to buy pens than to waste the rulers' time and thereby spoil them for future use.

DOWN-LINE PENS.—There are single, double and triple pens for down-line or perpendicular ruling, and if quadruple pens are desired, they can be made from seven-point faint or horizontal pens by bending the pens and filing them even with emery paper. Single pens are used for minor divisions and cent columns; double pens, for divisions or money columns; and triple pens, for especial divisions, such as debit and credit. The latter rule one purple and two red lines.

EXTRA-LONG DOWN-LINE PENS.—These pens are longer than the regular pens and are used in striking from different heads when ruling off the sheet, or to rule continuously while the smaller pens in the beam lift.

UNIT PENS.—These pens are cut from faint or horizontal pens in bars of three, four, five, six and seven,

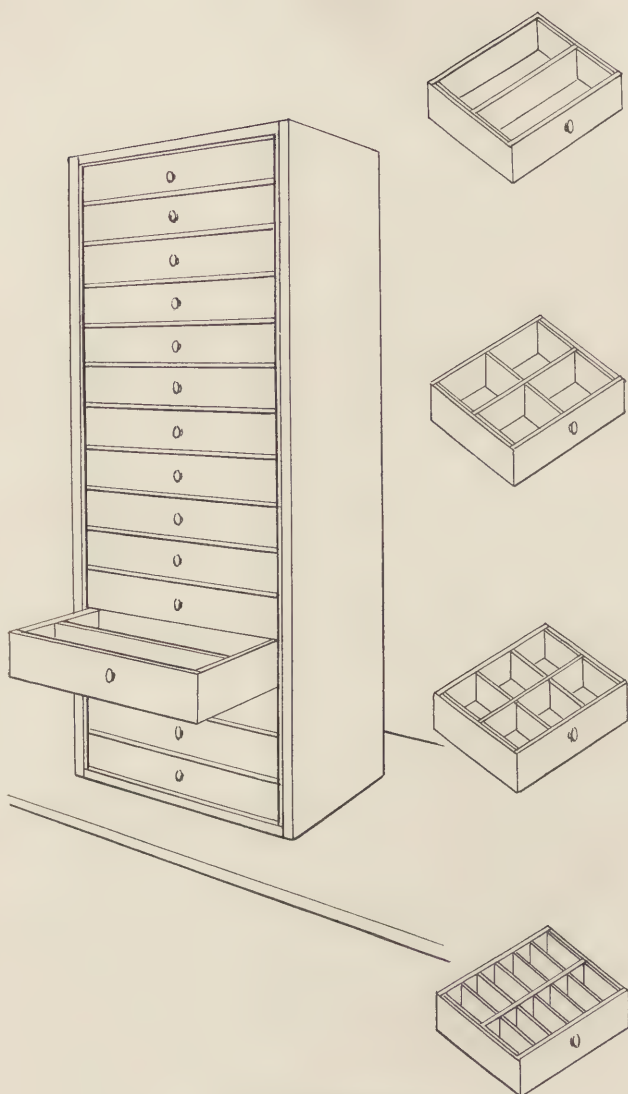
and are used for divisions in money columns. Seven, eight, nine, ten, eleven and twelve point pens are cut up for this purpose. These will cover all requirements for unit ruling in the majority of ruling establishments.

HEAD-LINE AND BOX-HEAD PENS.—Head-line pens are bars of four, five or six pens; the inner pens are bent so as to have the outer pens double. Box-head pens are double, triple or quadruple, and are spread out and cut with $\frac{1}{8}$ inch slant to prevent running blind when ruling close together off the sheet onto the blanket.

SHAVED PENS.—The regulation pens have a portion of the metal cut out between them; the upper portion of the surplus metal is turned back to the shank. The shaved pen is one in which the intermediate surplus metal is cut even with the shank.

PEN BOX.—The care of pens should be the greatest concern of rulers, for speed and accuracy are dependent upon their condition. Various methods are adopted which enable ready access to the pens; the best, however, is the pen box. Make a box with twenty-one drawers: fifteen drawers 6 inches long, 5 inches wide and 1 inch deep, for faint-line pens; each box with two compartments, $2\frac{1}{2}$ inches wide; four drawers for unit pens with proper compartments to take care of the different number of widths of pens; two drawers for single, double and triple, and head pens with suitable compartments for each size and style of pen. The size number of the pens in the box can be lettered on the outside to enable the ruler to pull out the drawer desired in a moment. This system is by far the most advantageous and should be adopted in all ruling-rooms.

CLEANING PENS.—When using dark blue, red, green or purple on horizontal pens, which are in the majority of cases used for faint-lining, dip a toothbrush in alcohol or ammonia and clean the pens. They should also be taken to the faucet and water allowed to run on them.



Pen Cabinet and Trays.

Unit pens on which three colors are used should be cleaned in like manner. When double or triple pens are used for other colors besides red, clean them in the same manner.

When pens become clogged and the machine is in operation, insert a thin scraper and effect an opening. Run the scraper through the pens on the blanket, thus preventing the soiling of the sheet.

New pens should be cleansed with alcohol or ammonia and the ink brush dipped in gall and run through the pens. This cuts the grease and permits the flow of ink.

FLANNELS.—For ruling purposes only the best heavy baby flannel should be used. All new flannels must be saturated with ink at least twenty-four hours before attempting to use them.

To the casual observer, making ready is a slow, dirty and undesirable operation. This impression is in a measure due to the haphazard method of cutting flannels and zephyr different sizes and throwing them in the bowls and so necessitating segregating and folding for making ready. To standardize flannels the following will be found to meet all requirements, and will expedite the work as well as eliminate searching for flannels best suited for different patterns. Cut the flannels 6 by 24 inches for faint blue, 5 by 24 inches for red, and 3 by 24 inches for green, purple and dark blue. Smaller flannels, which are mostly used for head and foot lines or a two-color division in perpendicular ruling and on extending penholders, are cut 2 by 8 inches and $1\frac{1}{2}$ by 8 inches. The large flannels when folded make long strips 3 by 24 inches, $2\frac{1}{2}$ by 24 inches, $1\frac{1}{2}$ by 24 inches, and enable the ruler to make ready with the least possible delay. The advantage is in knowing the sizes of flannels in the ink bowls and having an end which is free from ravelings.

ZEPHYR.—The best four-strand zephyr should always be purchased for ruling. When thin zephyr is desired for seven, eight or nine point unit ruling, split it, thus

making it two-strand. Before attempting to use, saturate in ink over night. All zephyr in daily use must be replaced at least four or five times a year. Cut zephyrs for faint blue 12 inches long; for red, 10 inches; for green, purple and dark blue, 8 inches.

"Cleanliness is the road to success," and as liquid will not flow through clogged, dirty flannels or zephyrs, a thorough cleaning with clean, hot water once a week is necessary. Grease, soap and oils should be kept away from the ink bowls.

INK-PROOF LAYERS FOR MAKING READY.—To build one or more colors on another, an ink-proof layer is necessary, and in this, as in other things, we find rulers have various choices. Some prefer heavy linen paper; others, rubber silk, tin, zinc, or just the plain rubber which is used by surgeons. All have merit, and, in addition to those mentioned, Texoderm possesses qualities which should appeal to rulers who prefer something besides a solid such as tin or zinc. To expedite making ready, cut the layers the following sizes: For red on faint, 25 by $2\frac{3}{4}$ inches and 18 by $2\frac{3}{4}$ inches; for green, purple or dark blue on red, 25 by $2\frac{1}{4}$ inches and 18 by $2\frac{1}{4}$ inches. Smaller pieces should be cut for head and foot pens.

INK BOWL.—A china bowl in which the ink is kept; small bowls are used for dark red, dark blue, violet and green; large bowls for faint blue and light red.

INK BRUSHES.—Bristle brushes set in hard rubber can be purchased in different sizes from $\frac{1}{2}$ inch to $1\frac{1}{4}$ inches in diameter. They are used to put ink on the flannels.

EMERY PAPER.—Used for filing pens.

TWEEZERS.—Used for setting, closing up and bending pens; also used for laying on and slip-looping zephyrs around pens.

SCRAPER.—A thin piece of brass used to open ink clogs in pens.

INKS.

Ruling inks are eosine and aniline, which are coal-tar products or benzol, and are purchased in powdered form. To dissolve, boil water and add a sufficient quantity of powder to produce a dark color; reduce by adding water until the desired shade is obtained. Some rulers prefer rain water and add a teaspoonful of vinegar, when mixing inks, especially for purple color; others claim that boiling the water kills the color and prefer cold water. These opinions are not of vital importance. Obviously rain water is preferable to water containing alkali, and those holding that opinion may be justified in their particular locality. Boiling water dissolves the color more quickly and more thoroughly than cold water, hence gives better results.

The following colors are purchasable from any reputable bookbinders' supply house and are recommended to be the best obtainable:

FAINT-LINE BLUE.—Pure indigotine; chemical pure soluble blue; French indigo paste; neutral indigo paste.

DOWN-LINE BLUE.—Patent royal blue; imperial blue; ultramarine blue.

RED.—Eosine; carmosine; vermilion red; bluish red; ruby red.

GREEN.—Emerald green (yellowish); bluish green; olive green.

PURPLE.—Violet.

BROWN.—Reddish brown; walnut brown.

YELLOW.—Lemon, medium, yellow, orange.

BLACK.—Jet black; gray black.

MAKING INK.

The following methods of making ink may be adopted when necessity requires, and by adding a little brown sugar and glycerine a copying ink is produced:

BLUE.—Add to one quart of water a little gum arabic and three-quarters of an ounce of sulphate of indigo.

RED.—Add to one pint of water 160 grains of eosine and a little gum arabic.

COPPER GREEN.—Add to one pint of water two ounces of acetate of copper, one-half ounce of cream of tartar, one-half ounce of glacial acetic acid.

VIOLET.—Add to twenty ounces of hot water one ounce of cudbear, one and one-half ounces of carbonate of potassium, one and one-half ounces of gum arabic, one ounce of alcohol and a few drops of creosote.

BROWN.—Add to one ounce of water forty grains of catechu.

YELLOW.—Add to twenty ounces of water one-third of an ounce of saffron and a little of gum arabic.

BLACK.—Add to one quart of water one ounce of coal-tar color, which is sold as nigrosine, and two ounces of gum arabic.

WHITE.—For ruling upon dark-surfaced papers, mix a good quality of white marbling color in warm water, add gum arabic as a binding medium and alcohol or ether as a drier.

INK PREPARATION.

INK SUSCEPTIBILITIES OF PAPER.—There are three grades of paper which concern the ruler, namely, engine-sized, tub-sized, writing and hand-made papers. These differ in quality and in price. The fibers used in their composition are different, but render them suitable to write upon. The engine-sized papers are the cheapest, and a mineral compound is used in sizing. It consists of resin and alum, which is added in the form of a solution,

according to the quality of paper, to the mass of pulp while in the process of reducing to a fiber in the beating engine.

The tub-sized papers are of a better grade, as the fiber consists of cotton or linen rags, blended with wood or esparto grass. The pulp is reduced in the beating engine and the sizing is prepared from bones and skins, technically termed "animal size." The sizing is done after the paper is made, passes from the roll through a bath or tub of size, and is dried over heated cylinders.

The more expensive tub-sized hand-made papers contain a purer quality of linen rag. The sizing is animal compound of a great density, and each sheet is dipped separately into the tub. The paper is then hung up on lines, and air or loft dried.

Paper manufacturing has reached a high state of perfection within the last few years; and few papers, such as railroad manilas, flats, bonds and ledgers, require the ruler's knowledge of ink preparation as did the hand-made papers of former years. Byron Weston's, L. L. Brown's and Crane's Linen Ledger are of a first-class quality and possess easy writing and erasing qualities; these papers need no preparation to enable them to take ink. The second-class ledgers, such as Defiance and Scotch Linen, are of a good quality and can be recommended for the ordinary run of books. For permanent records, Weston's, Brown's and Crane's are preferable.

That some papers possess ingredients which make the taking of ruling ink difficult, every ruler has some time or other experienced. Some papers are irregular in quality and this causes a loss of time, as flannels containing ink without preparation to obviate the breaking of lines must be thoroughly saturated with the prepared ink to prevent such breaking.

It is a known fact that the harder the paper the darker the ink required, and the softer the paper the lighter the ink. Railroad manilas vary in quality; some

rule without any difficulty, while others require considerable "doctoring" of all the colors. White and colored bonds of first-class quality need a darker shade of ink. Faint-blue ink requires treatment on some paper, when the other colors run smoothly and evenly. This is probably accounted for by the fact that the ink is considerably lighter than the other colors.

MIXING AND PREPARING.—The lack of success in ruling can almost invariably be traced to the want of knowledge of mixing and preparing inks. Rulers have so many different methods and opinions concerning inks because of the different water-resistibility in various parts of the world, that it is impossible to arrive at a definite basis upon which to govern the addition of gall, or substitute, to inks. A study on the part of rulers of the various makes of paper and the local water is essential to success. The problem, then, is to prepare inks that will produce a clear, solid line which will not spread. There are some papers upon which water will spread, so that it becomes necessary to add to the inks properties that will harden the water. Rock salt, sea water and powdered alum possess hardening properties. Gall, soda, borax, glycerine are used to prevent breaks, but it is advisable not to treat inks unless it is necessary. To determine the proper amount of soda, borax, glycerine or gall, put a half teaspoonful in a bowl of ink, mix well, and thoroughly saturate the flannel and zephyr. Slip-loop a zephyr around a pen, or lay a flannel on the pens and rule a sheet. If the lines break, more of the ingredient must be added. When dry, run the sheet through perpendicularly with red ink on the pens. If the red lines appear pale at the intersection with the blue lines, too much of the ingredient has been added.

PARCHMENT.—In ruling parchment, the ink should be mixed with gum arabic and ammonia. Some rulers prefer urine to water, but this is obviously repulsive and the results do not merit its use.

PRESERVING PROPERTIES.— At no time should more ink be mixed than is required for the work in hand. Should, however, it be necessary to mix ink which is to last a week or more, sparingly add an antiseptic such as cloves, creosote or carbolic acid. This will arrest disintegration.

OX GALL.— Analysis of ox gall reveals several constituents — glycocholic acid, lactic acid and choline. Glycocholic acid is a binding medium and is not soluble in water. Lactic acid and choline are soluble in water and akin to the first-named property. Ruling inks are practically colored water and these glycins are in some cases necessary. Ox gall stands preëminent as a binding medium, and is best suited for the majority of papers on which a binding medium is required. It is a natural compound of animal organic matter, is soluble in water, and will bind it to paper surface with another compound of animal organic matter. Care must be taken when adding ox gall to inks, as too much weakens the cross ruling at the intersection. When the too free use of gall is made apparent, the addition of alcohol will be found to have a neutralizing effect.

Ox gall can be purchased from any slaughter-house immediately after killing. The bile is removed and mixed with water and alcohol. Deodorized ox gall, which does not deteriorate with age, can be purchased from bookbinders' supply houses; this is likewise reduced before mixing.

GUM, SODA, BORAX.— There are some classes of paper upon which the addition of gum, soda (washing) and borax produce a much better effect than gall. The kindred law seems to reveal itself, as these ingredients are products of vegetable or mineral kingdoms, and, being soluble in water, will naturally bind the ink to paper which is composed of products of the vegetable and mineral kingdoms.

DRIERS.—Alcohol or ether is added to inks to hasten drying. A more powerful combination can be had by mixing four parts of sulphuric ether and one part of spirits of turpentine. This should at all times be used sparingly, for, like ammonia, it has a tendency to kill the color.

INK EXTRACTOR.—One ounce saturated solution of chloride of lime and one ounce acetic acid will remove ink spots. It neutralizes the effect of blue and black. Red blots on blue paper or faint blue are readily eliminated.

A solution of oxalic acid will remove red ink spots on blue paper and black on white paper.

One ounce of oxalic acid and one ounce of chloride of lime will remove red ink spots.

A pearl ash mixed with water will remove faint-blue ink spots.

Chloride of lime mixed with washing soda is a good cleaner for the hands. Four parts of ammonia to one part of washing soda is likewise used with good results. A mixture of three parts of alcohol to one part of glycerine is sometimes used for the same purpose.

PREPARING COPY.

Printers, bookkeepers and clerks rarely possess sufficient knowledge of ruling to prepare copy which will meet all requirements with the least possible cost. Novices can not be expected to prepare copy which can be as economically followed as if superfluous lines were eliminated, or perhaps stopped at the convenient point for the ruler. It is erroneous to presume that the man who orders the work knows what he wants, because such a man has no knowledge of the intricacy of the ruling machine, and may unwittingly compel the ruler to put a job through the machine a second, third, and possibly a fourth time, because of the iron-clad rule to unquestionably follow copy. When suggestions have been made to the customers regarding the stopping of a few lines

at the foot line instead of on the line above, they invariably remarked, "But the longer line will make it cost more!" That is, lines are made to stop because the opinion prevails that the longer the line the more ink used and the greater the cost. Men who know should be consulted before copy is submitted, or suggestions requested, which would reduce the cost; and then actual requirements be the guide. It is well to remember that in all ruled work the drops and lifts, the number of times a sheet is run through the machine, and the intricacy of the pattern, are all factors that determine the cost.

The ruling-feed gauge is usually at the right side, but on some machines it is at the left, in which case the sheets are fed to the head and left side, and turned if ruled on both sides. All ruling should be fed to the head. This method is most expeditious. A job of down-lining with a number of foot stops, which strike from three, four or more positions in the box-headings, could hardly be ruled from the tail edge without feeding it through a number of times. To facilitate reference on wide or double pages, every fifth horizontal line should be blue of a darker shade than the blue of the faint-lines.

HEADS.—On all blank-books having a printed head above the box-head, not less than 1 inch head margin should be provided for. The divisions of short subheads in the box-heads should be printed, but when there are numerous columns under a subhead a ruled line is preferable to printing. A printed head somewhere in the central portion of the sheet from which pens are to rule after lifting at a foot line above, should not be less than $\frac{1}{2}$ inch in width if the striking is to be done with the same pens in the same beam as those starting from the head-line. Failure to provide this space will mean considerable trouble in setting the striker and filing cams to enable smaller drops and lifts.

TRIM MARGINS.—When preparing copy for book ruling, $\frac{3}{8}$ -inch binding margin on both sides of the fold,

3-16 inch on each side of the page for the fore edge, and $\frac{1}{8}$ -inch head and tail trim margin must be allowed. On ruled blanks and cards, 1-16 inch trim margin should be allowed on all sides, as the sheets are more or less soiled in handling by the rulers and by pressfeeders if printed. On cards, the bevel left by the cutting knife on the off cut makes the trim margin essential, even if cleanliness of the hands were advanced as an argument against trim margins. All end columns on blanks or books should have a double rule about $\frac{1}{8}$ inch from the trimmed edge of the paper.

MARKERS.—To enable the ruler to detect any variation in striking, when printing is done before ruling, markers $\frac{1}{8}$ inch in length should be set on each end of the line. This insures accuracy when all horizontal lines and interlineal lines are ruled in the first run through the machine, and variations of power or striker can easily be detected. These printed markers are covered in the down-line or perpendicular ruling.

INDEXES.—All indexes should have a double line not less than $\frac{3}{4}$ inch from the edge of the page, to permit cutting in or pasting on index tabs. This also applies to all books whether indexed by tabs or cut in.

For each full account page allow not less than two lines in the index, and for the smaller accounts as many lines as there are accounts on the page. A fourteen-leaf index, medium, ruled in twenty-four point, provides fifty lines to a page and one hundred lines to a leaf. This should be lettered two letters to the leaf, which will be ample for the ordinary accounts up to 500 pages. A twenty-four leaf index would double the capacity and take care of the thickest book of ordinary accounts. These indexes should have a red line ruled down the center of the page.

LONG AND SHORT LEAVES.—Books containing long and short leaves are said to have double-folio pages. All

sheets are ruled the full length, and when the books are finished portions of the sheet desired short are cut off. To facilitate ruling and making up, books made up in sets with different rulings on each page and printed before ruling should be lettered alphabetically in the head-line.

FOLIO PAGES.— Ordinary blank-books are either regular or folio (double) pages; regular pages are numbered consecutively and folio pages in duplicate. The left and right sides of the open book constitute one folio page.

END-PAPERS.— Two sheets of every folio-page book are ruled on one side only, and these are made up into end-papers. To do this, the sheets are folded so as to have the ruling on the outer sections of tight or loose back books. Page one is tipped on the front and page two on the end. A folded blank sheet is then tipped in and the two outer leaves pasted together. Or these sheets may be tipped between the last two leaves of the book and the two outer leaves pasted together; this method saves one sheet on every book. On spring or patent back books the sheets, ruled on one side, are made up into marbled paper end-leaves. This method permits the book to begin with page one and end with a complete folio page.

PASTE-DOWNS.— All regular-page books should be made up with one additional sheet so as to allow a leaf on the front and back to be pasted to the end-leaf. A sheet is folded and tipped to the second and second last leaf of all tight and loose back books. This is obviously stronger than if two end-sheets were tipped one in another on the outer leaves of the book; besides, it utilizes the over-sheets and saves paper.

PAPER SIZES.— The following are the standard sizes, in inches, of writing and ledger papers in use, and blanks and blank-books should, as far as practicable, be made to conform thereto:

NAME OF PAPER.	For Blanks.	For Blank-Books.
Cap.....	14x17	17x14
Double cap.....	17x28	28x17
Demy.....	16x21	21x16
Double demy.....	21x32	32x21
	16x42	42x16
Folio.....	17x22	22x17
Double folio.....	22x34	34x22
Medium.....	18x23	23x18
Double medium.....	23x36	36x23
	18x46	46x18
Royal.....	19x24	24x19
Double royal.....	24x38	38x24
	19x48	48x19
Super royal.....	20x28	28x20
Imperial.....	23x31	31x23
Double elephant.....	27x40	40x27

COMPARATIVE WEIGHTS OF LEDGER PAPERS.

SIZES AND WEIGHTS.	14 x 17	15 x 19	16 x 21	17 x 22	18 x 23	19 x 24	20 x 28	23 x 28	23 x 31	23 x 34	26 x 33	27 x 40	31 x 53
14x17-14.....	14	17	20	22	24	27	33	38	42	46	50	64	97
16.....	16	19	23	25	28	31	38	43	48	53	58	73	110
18.....	18	22	26	28	31	34	42	49	54	59	65	82	124
20.....	20	24	28	31	35	38	47	54	60	66	72	91	138
15x19-20.....	17	20	24	26	29	32	39	45	50	55	60	76	115
22.....	18	22	26	29	32	35	43	50	55	60	66	83	127
24.....	20	24	28	31	35	38	47	54	60	66	72	91	138
16x21-20.....	14	17	20	22	25	27	33	38	42	47	51	64	98
22.....	15	19	22	24	27	30	37	42	47	51	56	71	108
24.....	17	20	24	27	30	33	40	46	51	56	61	77	117
26.....	18	22	26	29	32	35	43	50	55	61	66	84	127
28.....	20	24	28	31	35	38	47	54	59	65	72	90	137
30.....	21	25	30	34	37	41	50	58	64	70	77	96	147
17x22-20.....	13	15	18	20	22	24	30	34	38	42	46	58	88
22.....	14	17	20	22	24	27	33	38	42	46	50	64	97
24.....	15	18	22	24	27	29	36	41	46	50	55	69	105
26.....	17	20	23	26	29	32	39	45	50	54	60	75	114
28.....	18	21	25	28	31	34	42	48	53	59	64	81	126
30.....	19	23	27	30	33	37	45	52	57	65	69	87	132
18x23-28.....	16	19	23	25	28	31	38	44	48	53	58	73	111
32.....	18	22	26	29	32	35	43	50	55	60	66	83	127
36.....	21	25	29	33	36	40	49	56	62	68	75	94	143
38.....	22	27	31	35	38	42	52	59	66	72	79	99	151
40.....	23	28	32	36	40	44	54	62	69	76	83	104	159
19x24-24.....	13	15	18	20	22	24	29	34	38	41	45	57	86
28.....	15	17	21	23	25	28	34	40	44	48	52	66	101
32.....	17	20	24	26	29	32	39	45	50	55	60	76	115
36.....	19	23	27	30	33	36	44	51	56	62	68	85	130
44.....	23	27	32	37	40	44	54	62	69	75	83	104	159
20x28-54.....	23	27	32	36	40	44	54	62	69	75	83	104	158
23x28-65.....	24	29	34	38	42	46	57	65	72	79	87	109	166
23x31-72.....	24	29	34	38	42	46	57	65	72	79	87	109	166
23x34-80.....	24	29	34	38	42	47	57	66	73	80	88	110	168
26x33-100.....	28	33	39	44	48	53	65	75	83	91	100	126	191

1,000.....	2	40	1	20	347	260	208	173	149	130	116	104	95	87	65
1,250.....	2	290	1	145	430	323	258	215	185	161	144	129	118	108	81
1,500.....	3	45	1	273	15	387	309	257	220	193	172	154	140	129	97
1,750.....	3	285	1	398	99	449	359	300	257	225	200	180	164	150	112
2,000.....	4	50	2	25	184	13	410	342	293	256	228	205	187	171	128
2,500.....	5	55	2	278	352	139	11	426	365	319	284	255	233	213	160
3,000.....	6	60	3	30	20	265	112	10	437	383	340	306	278	255	191
4,000.....	8	70	4	35	357	18	314	178	81	9	452	407	370	330	254
5,000.....	10	80	5	40	193	270	16	347	226	135	64	8	462	434	317
6,000.....	12	85	6	43	28	21	217	14	369	201	176	108	53	7	380
7,000.....	14	90	7	45	363	273	418	182	13	88	288	209	145	91	443
8,000.....	16	95	8	48	198	24	119	349	157	12	400	310	236	175	6
9,000.....	18	100	9	50	33	275	320	17	300	137	11	410	297	258	96
10,000.....	20	100	10	50	367	25	20	184	443	263	193	10	418	342	131
		100		100	101	100	100	104	2	2	107	2	98	1	96

RULING BEFORE PRINTING.

Printing before ruling can be done on the ordinary run of work, especially large runs, but on small runs and small-size sheets ruling first is preferable.

If a job can be ruled eight, ten or twelve to the sheet, and it is deemed expedient to print it two, three or four on, it would be preferable to rule before printing. There can be no fixed rule for this, as it depends on the character of the work, and the interdivision coöperation spirit should take into consideration the cheapest and best way to complete the work. If an extra hour spent in the composing-room saves two or three in other divisions, that extra hour should be spent in that division; if by spending an extra hour in the pressroom three, four or five hours can be saved in the bindery, it ought to be done. Lack of binding knowledge is responsible for many improper make-ups in the composing-room. In making up of all book forms, blanks and blank-books, the method of handling the job in the bindery must be taken into consideration. Forms are improperly made up when they can not be handled expeditiously in the bindery. A close study of binding methods will produce better results, as well as greater profits, for the printer.

PROOF OF RULING.

When customers require proof of ruling, mark a sheet with pencil and indicate the colors to be used thereon. It is neither advantageous nor profitable to furnish a sheet when pens are set, as holding the machine is a loss to the owner, and few customers are willing to pay the cost of waiting. Then, too, if changes are made they virtually require resetting of pens and making ready; or, if the ruled proof submitted is O. K.'d, considerable time is lost in restarting the pens. The ink becomes dry and a scraper must be drawn through each pen to make an opening. The ruler must exercise great care in ruling,

as the ink does not flow as readily through pens in which it has become dry. If proofs are desired on printed forms, it is advisable to set the type in the composing-room, draw a proof and indicate ruling with pencil thereon. This gives the customers a chance to change copy before the stock is spoiled.

HANDLING PAPER.

When paper is received in the ruling division, the first care of the ruler should be to verify the count with work-order instructions. See that there are enough over for ruling and printing, and if special work requires additional sheets for spoilage, the fact should be made known. In ruling long runs not less than six sheets per ream should be allowed for overs. The intricacy of the pattern is the prime factor which should determine the exact number necessary per ream. The top and bottom sheets are spoiled in jogging and handling and can not be included as available for overs. The rulers and cutters and pressmen should never allow the top and bottom sheets to be placed in the center of the ream when jogging the paper, as that will soil two additional sheets. Next, prove the squareness of the paper on book ruling, and, if found to be accurate, proceed; if not, send it to the cutting machine to be squared.

SQUARING PAPER.—In squaring paper, it is well to remember that two edges only need to be trimmed. Jog the paper on the long side and put it in the machine against the side and back gauge. Trim about 1-16 inch off the end, turn the paper over, and put the same edge against the side and back gauge, and trim just enough to square the sheets. The edge which was jogged to the side gauge is marked, and used for the head in horizontal or faint-line ruling. Paper which has no down-line or perpendicular ruling need not be squared. The facilities for squaring paper are in every paper mill, and in the majority of cases three sides will be found to

be square; especially is this true of first and second class ledger papers and the better grade bonds. Railroad manilas and flat are not reliable in this respect. The fault is probably due to lack of care in cutting cheap paper.

BURR ON PAPER.—In cutting, the knife leaves a burr on the downward side which aids the striker gate to hold the sheet, as ordinarily the blanket draws the thin paper under the gate when the burr is on the blanket. When ruling thin paper with perpendicular lines on one side only, lay the paper on the feedboard with the burr up.

PILING-TRUCK.—The most useful appliance for handling paper is the truck for transportation and storage. There are several makes of trucks upon the market, but



Barrett Multi-Truck, Barrett-Cravens Co., Chicago.

all work upon the same principle. The truck is built close to the floor, and has roller bearings to make movement easy. In connection are platforms or "skids"

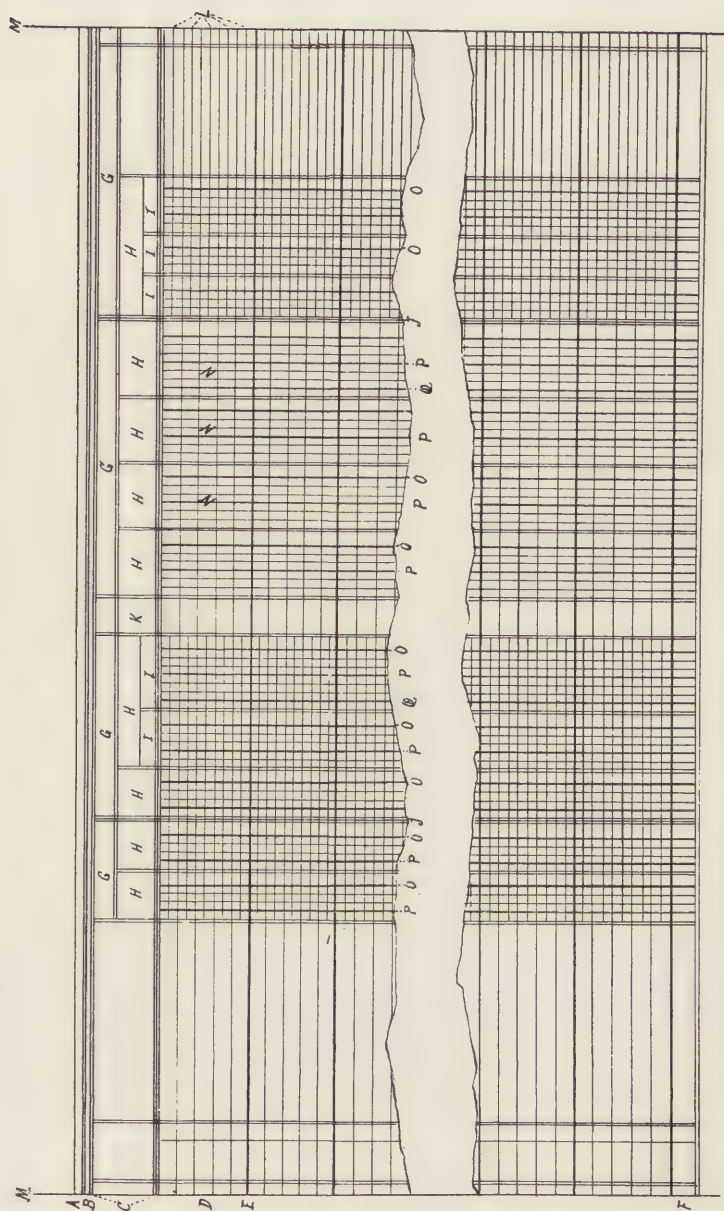
upon which stock is piled. The truck may be pushed under the platform, fastened thereto, and the whole may then be pushed to any desired position. Time and the labor of repiling are thus saved, and storage is made a simple matter, rearrangement being thus made a minor consideration.

SETTING PENS.

Due to the time-saving appliances possessed by some shops and not by others, methods of setting pens are at variance. It is evident that ruling machines with the second beam and underlift can complete the average run of work in much quicker time than is ordinarily required on a single-beam machine. The little extra expense entailed in purchasing the second beam and underlift should not deter any owner in putting his establishment on a competing basis with up-to-date houses. These attachments may be put on any ruling machine without alteration. The single-beam machine is antiquated and has no place in modern bookbinderies.

Some clamps have a thin piece of board lined on both sides with rubber between the jaws; some have an extra layer of rubber between the jaws. Both schemes are excellent; and where the pens are ruled close together and striking from different heads, on a single-beam machine, these clamps are most convenient. The most advantageous clamp for any machine, however, is one which has two layers of hard rubber between the jaws. This enables pens to be set from different heads close together.

After all the preliminary work is done, such as preparing inks, adjusting the machine, verifying count and the squareness of the paper, take a sheet from the center of the ream and put it against the feed gauge, and draw a line across the sheet with a square measure. Next, carefully peruse the copy and put the edge on the sheet close to the drawn line and mark it; two lines



A — Faint-line. B — Head-line. C — Box-head. D — Faint-lines. E — Dark blue to facilitate reference on large sheets. F — Foot totals. G — Heads. H — Subhead. I — Divisions of subhead. J — Main divisions. K — Binding space. L — Interlines. M — Trim margin on fore edge. N — Unit lines. O — Cents division. P — Hundreds and thousands division. Q — Hundred thousand and million division.

for doubles, three or four for head-line, and a mark on each end for the faint-lines. Some rulers prefer to prick the pattern by simply laying the copy, which in such cases is to be followed, on a sheet and pricking it with a pin. Then tighten the blanket-adjusting roller and adjust the gauge so that the sheet neither crowds nor leaves the gauge. Then feed the sheet into the machine and set the pens.

All pens should be set pointing downward at an angle of forty-five degrees. Care must be taken that the tension of all pens is the same on the sheet; that all bear uniformly, with the same light, even pressure. They must be of the same length and must have the same point or bearing face on the paper, as the ones bearing more heavily will make a stronger line than others.

Set the pens, each point corresponding with the line it is to rule, on the pattern. It is essential that all of the points be in a straight line when the beam is raised and the points are in the air, for if one or more of the points are out of line, they will strike the paper sooner or later than the others.

If all the pens used are of the same length, and the straight line of their points makes a diagonal to the head-line on the pattern, then the beam should be adjusted by sliding the standards forward or backward in the standard shoes until the lines of the pen points, the beam and the clamp are all parallel to the head-line. If the sheets be curled, it is well to test the pens on the blanket; or irregular setting can be detected by raising the beam and looking at the pens from the side. A better plan is to take a thin sheet of paper and set the pens so that they barely touch, then lower the adjusting screw on the arm of the pen rest from 1-16 to $\frac{1}{8}$ inch. Next take a fine emery cloth or paper, preferably No. 00, and feed in the machine as many sheets as are necessary to file all the pens with one operation. Drop the pens on the

emery paper and give a quick forward turn with the crank handle, raise the pens, turn the machine back, and repeat the operation until the pens are filed the same angle. Three or four turns of the handle will suffice. Then set the pen rest and put the tension spring close to the arm on the opposite side of the machine.

Whenever one side of the machine has a heavy unit pattern and the other side has but a few double or single pens, put several bars of unit pens on the latter half to counterbalance drawing of the sheet due to the weight of the pens on the paper. Care must be taken that no ink gets in the pens not intended to rule. Tallow should never be put in the dollars and cents and hundreds and thousands divisions of unit pens, as zephyrs are apt to come in contact with it and cease to feed ink.

In some struck patterns it will be noticed that the struck lines start from two or three head-lines close together, all these struck lines running off the foot of the sheet. Patterns of this sort can often be ruled by one striker beam at one feeding by using two or three different lengths of pens, known as extra-short, regular and extra-long pens, so set in the clamp that each length of pen will drop on its respective head-line at the lowering of the beam. As all these pens run off the foot of the sheet, the pens can then be raised after all have reached the cloth.

SMALL RUNS OF VOUCHERS.—Questions frequently arise as to the best methods of procedure in determining whether it would be best to set one or more patterns, or run the sheets through a second time. If two or more patterns of the job can be set more quickly than it would take to feed the paper through the machine, the pens should be set. Rulers should be guided by the time required to perform the operation. A job of 1,000 vouchers; size, $8\frac{1}{2}$ by $7\frac{1}{4}$, which cut six to a sheet of 17 by 22, having horizontal or perpendicular ruling, is

one which is open to debate. The different methods employed are as follows:

(1) The patterns are set for the end and center, then the sheets ruled, after which the center pattern is taken down, the sheets turned, and ruled on the other end. This gives two feeds on the horizontal and perpendicular ruling.

(2) Or the sheets can be fed through the machine twice for the horizontal lines by setting two patterns in a short beam. Then the top pattern is taken down and the clamp shoved over; or, if there be a hand-wheel movable guide, move the guide and rule the end. This permits the perpendicular or down ruling to be ruled in one feed.

(3) A third way would be to set one pattern and feed the sheets through the machine three different times. After the first and the second feed, move the clamp. This, likewise, requires but one feed for the perpendicular or down ruling.

(4) A fourth method is to set one pattern of the horizontal lines on the end farthest from the gauge. After the first and second feeds, move the guide. This, of course, can only be done when the guide is moved by a movable guide. This, likewise, needs but one feed for the perpendicular or down ruling.

The last scheme is preferable, especially when there are intricate horizontal patterns. Should the perpendicular ruling be intricate on the same pattern, the sheets can be cut in half, which will only necessitate feeding 334 sheets, $8\frac{1}{2}$ by 22, and setting one down-line pattern. This is quicker than to set two patterns and feed 167 sheets.

LEDGER RULING.—Ledgers have from one to four or more accounts to the page; more than one necessitates changing for each account. Some rulers lay the flannels on the faint pens for the one account, and when chang-

ing to the two accounts lift the pens, then push them down and lift others for the three accounts. This is repeated until the job is completed. Bending or raising pens to this extent is injurious and should not be tolerated. The different methods employed in modern establishments, having double-beam machine and underlift, are as follows:

The faint-line pens for the full sheet are set in the second clamp, and all head and foot pens in the first beam clamp; or vice versa. Use cut pens double, triple and quadruple for head-lines. Penholders are not necessary. Divide the number of horizontal pens into four equal parts, omitting three lines for the foot-line and head space in each part. Then rule one faint-line and omit one line for the triple head-line. Slip-loop faint zephyr around all faint pens which are to rule, and lay from six to eight layers of flannel on top. Then slip-loop or lay red zephyr on the red pens in the first beam and lay from four to six layers of red flannel on top. Put four pieces of tin, 2 inches wide and long enough to reach the beam clamp, which is bent downward, in the extension penholder clamp above the head-lines. Lay purple zephyr on the center pens with from four to six small layers of purple flannel on top. When the four-account sheets are ruled, slip-loop faint zephyr on the pens required to rule and remove zephyr from the pens which are not to rule. Make the necessary change on the head and foot pens in the other beam, and make ready as described above. Continue from three to the two accounts, then to the one account in like manner. The quickest way on machines having but one beam is to make an extra run of the head and foot pens, unless it is a large order, in which case extension penholders should be used.

HORIZONTAL RULING.—All faint-line pens are set in the first beam clamp straight to the line, and the head and foot pens in the second beam clamp. This method

is by far the quickest and best, as it avoids cutting pens on jobs which have totals or foot lines. Besides, the colors are separated, which is an advantage in making ready. With machines which have but one beam, the cutting of pens is almost a necessity, unless extension holders are employed. On jobs which have numerous heads and totals it may be better to run the box-head and foot-total pens in the first beam, and the faint-line pens in the second beam, as on some machines a better register can be had from the first beam. Patterns having but one box-head and faint-lines can be set in the first beam.

The speed of the machine must be governed by the condition of the atmosphere and the size and quality of paper.

INTERLINEAL HORIZONTAL RULING WITH SUBDIVISION BOX-HEAD RULE AND FOOT TOTAL.—Opinions differ materially as to the best method for ruling horizontal interlined patterns on double-beam machines. On single-beam machines there can be no difference of opinion, as interlines necessitate another run and must be ruled after the down-ruling is completed. On all small jobs the interlines should be ruled after the horizontal and perpendicular ruling, as it is quicker to make an extra run than to set the striker and pens. The horizontal pens can be used where there is but one interline between the horizontals; thus time is saved in setting pens. The method which would seem the most natural one would be to rule interlines with the horizontal in the first run through the machine. If the job is a book pattern ruled on expensive paper, take ten sheets of flat paper, as well as a few sheets of the job; rule single faint-lines where the interlines are to drop and lift. This is done to set and verify the striker during the progress of the job through the machine. The interlineal faint-blue pens and the subdivision box-head pens are set in the first clamp beam, and the horizontal faint blue, box-head and

foot total in the second clamp beam. The striker gate is adjusted as described in subsequent chapter on striking. The cams for the subdivision head-lines are set in the groove of the underlift wheel and for the interlines in the striker wheel.

RULING INTERLINES AFTER HORIZONTALS.—Some rulers prefer to rule horizontal and interlines after the perpendicular or down ruling is completed, and claim that better results can be accomplished. To do this, if the job is a book pattern ruled on expensive paper, take about ten sheets of flat paper, as well as a few sheets of the job, and rule faint-lines for the box and subdivision heads. The perpendicular or down lines are set as described under perpendicular ruling, and the sheets which have been faint-ruled to indicate the heads are used to set and verify the striking during the progress of the job through the machine. After the down-ruling is completed, the horizontal and interlines are ruled as described under the preceding head. On small jobs it is preferable to make an extra run of the interlineal lines after the horizontal and perpendicular ruling is completed. For accuracy, this is the surest; and on small runs, the quickest.

PLAIN PERPENDICULAR RULING WITH BOX-HEAD.—A sheet is marked to indicate the position of the pens by taking the copy, folding it, and placing it on a sheet even with the head-line, or by pricking with a pin and marking as described under a preceding head. All pens are set straight to the line with equal tension. The blanket is adjusted so that a sheet can be easily withdrawn. The double pens striking from the head-line or subheads are set in the first beam clamp; the single pens (cents division) are set in the second beam clamp. On single-beam machines, set extra-large pens for divisions and regular single pens for the cents divisions, when ruling off the sheet. The striker cams are set to drop the pens at the head-line and lift at the foot total. With

the underlift the first beam pens can be struck from four different heads and lift at a foot-line a number of times to a sheet. The second beam pens can be struck and lifted a number of times. Different colors can be ruled in one run through the machine. They are built up on each other as described in the chapter on making ready.

PERPENDICULAR UNIT RULING WITH BOX-HEAD.—The operations are the same as described in the plain perpendicular ruling, except that unit pens in bars of four, five, six or seven pens are set in the first beam clamp and the division pens in the second beam clamp; or, when the underlift must be used, the unit pens are set in the second beam clamp. On all small jobs it is preferable to make an extra run of the unit pens. When both halves of the sheet have a heavy unit pattern and the same ruling, the pens are set on one-half of the sheet, and the gauge or clamp is moved over. All pens are set straight to a line and with equal tension. The colors for unit pens are usually faint blue, red and dark blue. The faint-blue zephyrs are slip-looped around each pen on which that color is desired, the red zephyrs are placed on the dollars and cents divisions, and the dark blue on the hundreds and thousands divisions. The colors are built up on each other as described under the chapter on making ready.

MAKING READY.

Were it possible for a man to visit the principal ruling-rooms in the world, he would no doubt be astonished at the different ideas that prevail on making ready. There should be no quarrel with any method which is expeditious and produces results. Some rulers prefer to have their ink bowls full of long zephyrs and to wind all straight faint-blue patterns, claiming that that is the safest way to prepare the pens. Zephyr in long pieces should not be used in making ready, because it invariably becomes tangled and too much time is lost in untangling it.

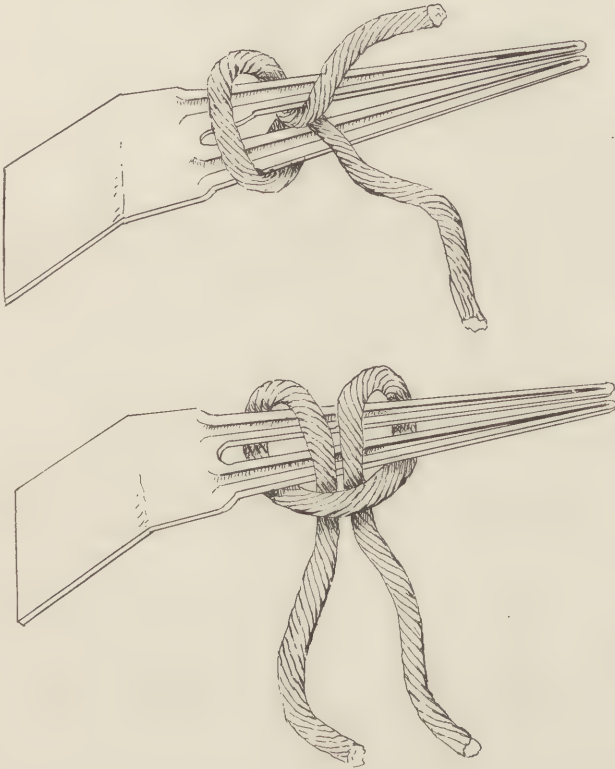
In ruling blanks or books, fancy or combination head and foot lines, consisting of from three to six pens in a group, are often used. These rule lines close together of different colors. This combination of colors is left entirely to the judgment of the ruler. When using yellow, make the lines very fine by pinching the points together with the pen tweezers, as this color seems to spread and makes a wider line. Extension penholders are sometimes used when combination head-lines are ruled, to rule one of the colors, so as to eliminate any chance of the colors mixing. Care must be taken that overhead cords do not run too close to the pens or directly under. Shift cords, upper and lower, to run between the lines. If lower cords are permitted to run on the lines the sheets will be soiled and the lines look ragged.

Faint-blue clamps should never be used for red, green or purple patterns, and vice versa, as flannels become affected by the color in the wood, and the result is a muddy-looking color on the sheets.

ADJUSTING LAY-BOY.—The lay-boy should be adjusted so that the sheets fall a little to one side, and so prevent the head-lines from smearing if the ink is the least wet. Set the curling pieces so that they will bend the sheet in the form of a "U," which will make it stiff, so that it can be thrown into the box of the lay-boy. Set the adjustable side pieces to fit the sheet exactly on both sides. Set the jogger arms out near each end of the sheet so that they will be vertical at the end of the forward stroke and push the back edge of the sheet back squarely against the arms. Then move up the sliding frame and adjustable tail-piece until it touches the front edge of the sheet, and lock with the thumbscrews. If a wide sheet is being ruled, use both tail-pieces.

FAINT LINES.—Faint-line pens can best be made ready by drawing the brush through the faint pens and laying from six to eight layers of flannel $\frac{3}{4}$ inch on the pens, extending $2\frac{3}{4}$ inches on the clamp and beam. If

the box-head pens are set in the same beam, the faint-blue flannel should cover the first pen and have a zephyr slip-looped around it and laid on top of the flannel. This prevents the flannel from working away from the pen.

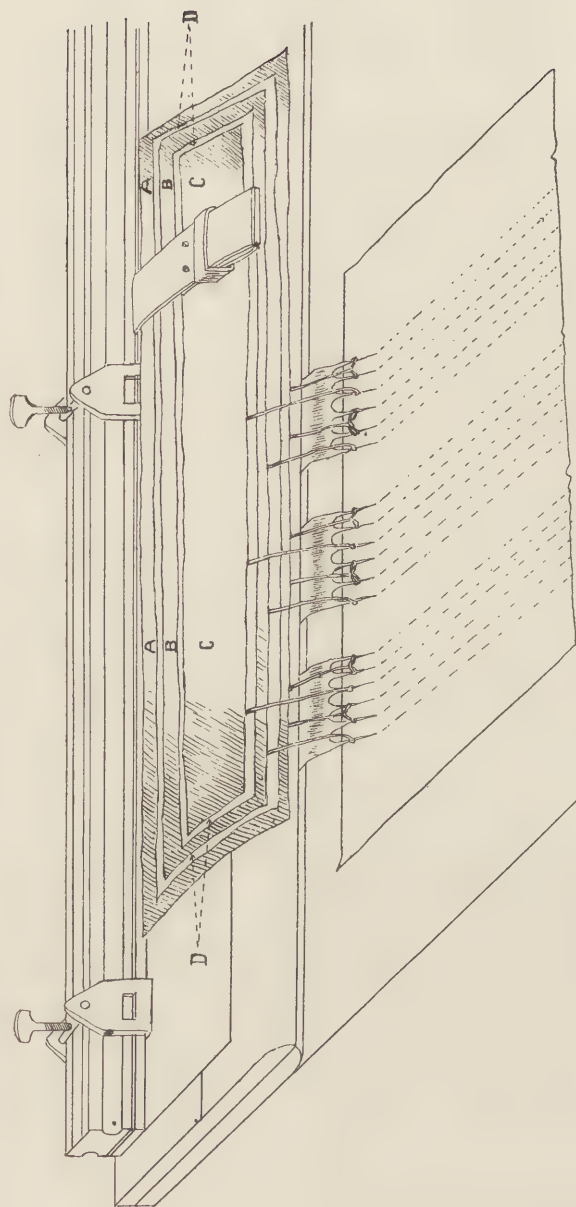


Then lay on, or slip-loop, the red zephyr around the box-head pens and lay six layers of red flannel on top. For this purpose the small flannels are used. Next, take a piece of tin and place it in the extension holder clamp, and lay on the purple zephyr on the head-line pen on top of which from four to six small purple flannels are laid. If a faint-line pen is run above the head-line, then

slip-loop a zephyr around it and lay three or four layers of flannel on top. A piece of ink-proof layer is laid on top of the faint-blue flannel and the zephyr slip-looped around the red head pens, and red flannels laid on top. For the purple, proceed as above described.

DARK REFERENCE LINES.— If every fifth line is to be a blue of a darker shade, the faint-blue zephyrs are slip-looped around the pens, leaving every fifth pen for the darker blue. Six to eight layers of flannel are placed on top about 1 inch from the shank of the pens. A piece of ink-proof layer is placed on the faint-blue flannels; then the dark-blue flannel is laid on, and the zephyr slip-looped around every fifth pen, after which about four layers of flannel are laid on top. The red zephyr is laid on or slip-looped around the box-heading and total pens extending on the clamp, and covered with about six layers of flannel. A piece of tin is placed on the red flannel, and the purple zephyr laid on the center of the triple or quadruple head-line pens, on the top of which about four layers of flannel are laid.

THREE-COLOR PATTERN.— To make ready a unit pattern, put a sheet of paper under the pens and lay two layers of faint-blue flannels on the clamp about 1 inch from the shank of the pens. Slip-loop faint-blue zephyr around all pens on which that color is desired; then lay six to eight layers of flannel on top. Put a piece of ink-proof layer on the faint-blue flannel, so as to leave about 1 inch on top to feed the ink. Lay two layers of red flannel on the ink-proof layer and slip-loop red zephyr around the dollars and cents division pens; then lay four or six layers of red flannel on top. Put another piece of ink-proof layer on the red flannel, so as to leave about 1 inch to feed the ink; then put two layers of dark-blue flannel on top. Slip-loop the dark-blue zephyr around the hundreds and thousands division pens; then lay four layers of dark-blue flannel on top.



A — Faint-blue flannel. B — Red flannel. C — Dark-blue flannel. D — Ink-proof layer.

Pumping on two or three ply-back pens is sometimes avoided by rubbing the clamp with a piece of blotting paper saturated with oil or vaseline. When slip-looping zephyr around such pens, fasten them below the solder.

STARTING PENS.—In starting pens, take a soiled sheet and put it under the beam and on top of the underlift and striker gate; then flood the flannels. After the pens have stopped dripping, carefully remove the sheets and avoid getting ink on the blanket. Next feed a soiled sheet into the machine and drop the pens; with a thin scraper start the pens which fail to rule. Take the sheet and place it on the cords under the beam and work out the pens; pinch those running wide, and open up all running light with a somewhat wider scraper. Rule one sheet and compare with copy. If pens need moving, do not bend, but loosen the clamp and shift as required.

Care must be taken to prevent the colors from running together. When flannels are all laid on, put two narrow extension penholders on each end of the pattern, through the extension penholder gripper strip situated on top of the beams, bending the holder so that the pressure of the end will be on the flannel. Tighten the extension pen gripper dogs and the flannels will be held firmly in place. This is far better than driving pins through the flannels into the beam.

RUNNING BLIND.—To obviate double or triple pens running blind, avoid bending the pens so that the heels or toes come together; file the burr with a thin piece of board on both sides of which emery paper has been glued. Pull a piece of blotting paper saturated with vaseline or oil between the pens.

INTRICATE PATTERNS AND LONG RUNS.—On long runs and intricate patterns having two or three colors, it would not be profitable to take the flannels down at night and reset the next morning. To leave ink in the pens

over night means considerable trouble in restarting the next morning. The following will be found to meet all requirements with the minimum of trouble: Take the ink brush and squeeze dry; then rub on the flannels, and squeeze the ink out of the brush into the ink bowl. Do this with all colors; then set the pens on a piece of blotting paper, and run through until the flannels and pens are dry. The next morning flood the ink, and start the pens in the usual manner.

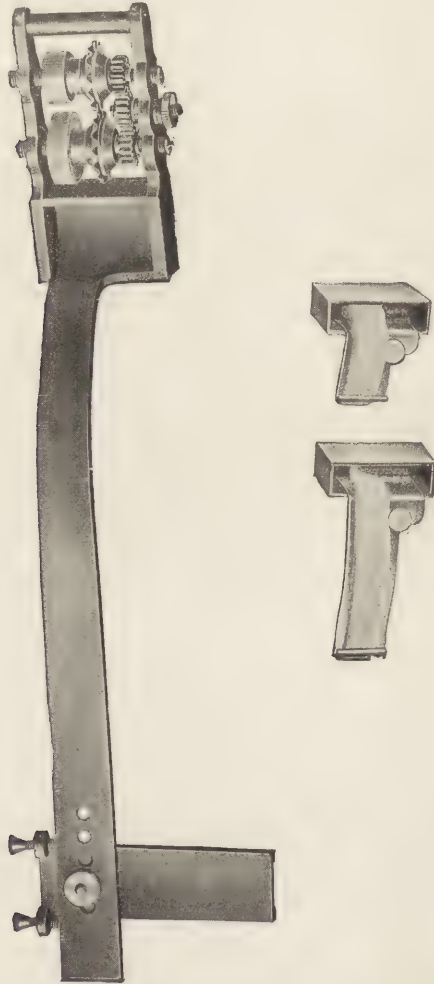


Barrett-Cravens Ink Fountain, Chicago, Ill.

INK FOUNTAIN.—An ink fountain which is claimed to be superior to the stop-cock fountain has been recently invented. This fountain, when once adjusted, requires no attention. When the pen beam is raised, the flow of ink stops; when lowered, the ink starts to feed the flannels. The ink pan is connected by means of a flannel feeder, and requires but a few seconds to adjust to the flannels.

FANCY WAVE DISK LINES.

The disk attachment rules a variety of fancy lines with the same facility and speed that straight lines are ruled. Waved disks are used to produce the lines. This makes



Fancy Wave-line Attachment for Adams Disc Ruling Machine.

wave-line ruling easy for any ruler to accomplish without trouble. The patterns are varied by shifting the shafts laterally, with the adjusting screws, or by changing the rotary position of the shafts one with the other by engaging the gearing in another tooth; by means of the movable stud gear; and by inserting disks of a different design. It can be attached to any pen machine.

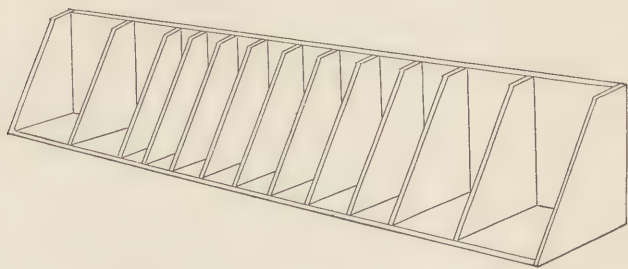
SETTING STRIKER.

To prepare the machine for striking, take a sheet from the center of the ream and test its squareness. Measure the length of the sheet the way it is to be down-lined, and select a change-gear that will space a trifle more on the blanket than the length of this sheet. Each change-gear is marked in inches the length of paper it will space. Place this change-gear on the end of the pen-cylinder shaft and lock it into place by means of the lock-lever nut. Raise the intermediate gear until it is meshed tightly with this change-gear. Lock it into place by means of the lever on the stud. Loosen the blanket-adjusting roller near the string cylinder enough to permit the withdrawal of the sheet with ease. Care should be taken to have the overhead cords run between the finger blades of the gate, as sheets are sometimes carried under the gate and soiled by the pressure of the gate on the cords. If these adjustments have been made and the sheets crumple up at the gate, as in the case of thin paper, loosen the overhead cord-adjusting roller. Then feed a sheet into the machine from both ends and adjust the gauge so that the sheet will neither crowd nor leave the gauge on either side. When this is done, adjust the gate so that the sheet touches both ends at the same time by turning the worm gear in the shoe of the right-hand standard, and move the striker gate forward or backward as required. Reverse the sheet, and if it does not crowd or leave the gauge when it hits the gate the machine is ready for setting pens. Should the sheet leave

on the one end and crowd on the other, the paper is not square, and before any attempt is made at ruling it should be taken to the cutting machine to be squared.

The end sheets of every ream are not reliable because dull cutting knives drag the paper. On large runs, if proper care is taken and sheets from the centers of a few reams tested, a happy medium can be arrived at. If on some reams the sheets run off or crowd the gauge a little, it will probably not make any material difference. Should, however, the difference be too great, it might be well to test the reams and segregate them, thus reducing the changes of the gate, beam and cams to the minimum; or square the paper. Changing of the striker and gate is to some extent eliminated on machines having adjustable steel guides, as they have been designed to obviate such difficulties.

The cams should then be set in the cam head at the ruler's side of the machine. Each striker cam head has an equipment of sixty-seven pieces of regular 8-inch cams



of different lengths. The two slots in the head are used for adjusting or sliding along the cams to make a longer or shorter lift or drop. With the beam in position, set a cam in one of the slots just back of the pen-rest shoe or toe plate. Fasten by means of the thumbscrews. Turn the machine by hand until the next lift is to occur, when the pens are to be raised again from the paper. Set another cam in either slot so that the toe plate or pen rest

will strike it and raise the pens from the paper at the proper point. Set another cam in the other slot and turn the machine by hand until the proper place is reached for the pens to drop and begin ruling again. Adjust these last two cams back and forth until the proper spacing is obtained for the lift. If the cams are too long to allow the pens to drop at the proper point, use shorter cams. If the cams are too short, use longer ones. Repeat this process until the whole sheet is covered, setting the cams to drop and lift the pens at the proper places. Always have the pens lift at the end of each sheet, and keep them raised by means of the cams until the proper place of the next sheet arrives to be struck. The cam head makes one complete revolution to each lift of the gate, or, in other words, one revolution of the cam head will cover the distance from the front edge of one sheet of paper to the front edge of the next sheet.

It will be noticed that when power is applied the drops and lifts of the pen will not fall exactly on the line. The ruler will then have to adjust the cams forward or backward a trifle to have them raise and lower the pens at the proper places. To obtain first-class perfect striking, the power must be even and steady.

The toe plate of the pen rest for ordinary work must rest on the cams directly above the center of the cam head. If very short lifts are required, the best results can be obtained by adjusting the standards so that the toe plate will rest on the cams to the feeder's side of the center line of the cam head for good striking. Special pointed toe plates are often made to be used for short drops and lifts. Set the pen rest so that it will raise the pens not more than $\frac{1}{8}$ inch from the paper.

All necessary adjustments for raising and lowering the beam, tilting the beam, raising and lowering the pen rest, moving the standards back and forth, and adjusting the gate, will be found on the standards.

A light rubber band, fastened from the pen rest to

the standard, is sometimes advantageous in holding the toe plate of the pen rest firmly down against the cams. Do not use a very heavy band, as the toe plate and cams will then wear out quickly. It is also advantageous to put a drop of oil on the cams to reduce the sliding friction and to prevent this wearing, which will occur to a certain extent even when a light band is used.

SECOND BEAM.—To operate the second striker beam, slide up into place the intermediate brass gear that meshes with the brass gear on the inside of the first striker cam head, until it is meshed firmly with the gear on the inside of the second striker cam head. Then lock with the lever on the stud. To set the pens, cams, etc., proceed as above described for the first striker beam.

To operate the third beam, proceed as with the second and first beams.

STAGGER.—Sometimes, in striking, a stagger or curved line will be noticed just as the down line commences at the head-line. To overcome this, the beam should be balanced as evenly as possible, so that all the weight of the flannels, etc., will not be on the pen side of the beam; also raise the pens the shortest distance possible when striking. Most important of all is to set the spring of the preventive-of-jar-to-beam almost vertical, with a slant of about five degrees from the perpendicular, toward the rear end of the machine. Move up the whole preventive-of-jar-to-beam so that the spring is held firmly against the toe plate of the preventive-of-jar-to-beam arm, which is situated on the end of the beam opposite the ruler. This should stop entirely all stagger.

SPRINGING PENS.—By springing pens several different heads can be struck with the underlift and have all pens stop at a foot-line. To do this, set all pens for the underlift and first-beam strike in the clamp straight to a line. All pens striking from the head-lines are operated with cams set in the outer slot of the cam head to raise the pens where ruling is not desired. The first

subhead pens are set $\frac{1}{8}$ inch lower than the second; the second subhead pens are set $\frac{1}{8}$ inch lower than the third. The tins, brass, or the spoons are adjusted in a corresponding manner. The cams to lift the first subhead pens are of regular height, while those for the second are $\frac{1}{8}$ inch lower, and the third $\frac{1}{8}$ inch lower than the second. A difference of about 2 inches in the head can be made to lift at a set line by this method. All pens used in springing should have the heel and toe sand-papered with a piece of sand or emery paper glued to binders' board. This will obviate broken lines and prevent double or triple pens from running blind.

CONTINUOUS AND STRIKING LINES WITH ONE BEAM.—

In certain struck patterns, one or more lines will be noticed to run across the entire sheet from edge to edge in the same direction and parallel to the struck lines. These lines in most cases can be ruled at the same feeding that the striking is done, by clamping the pens in extension penholders and the extension penholders in their clamp on the top of the beam. These pens should bear quite heavily on the paper, so that when the beam rises for striking, the spring in the extension penholders in question will hold the pens against the paper from edge to edge and will not rise from the paper with the striking pens. The through lines can thus be ruled.

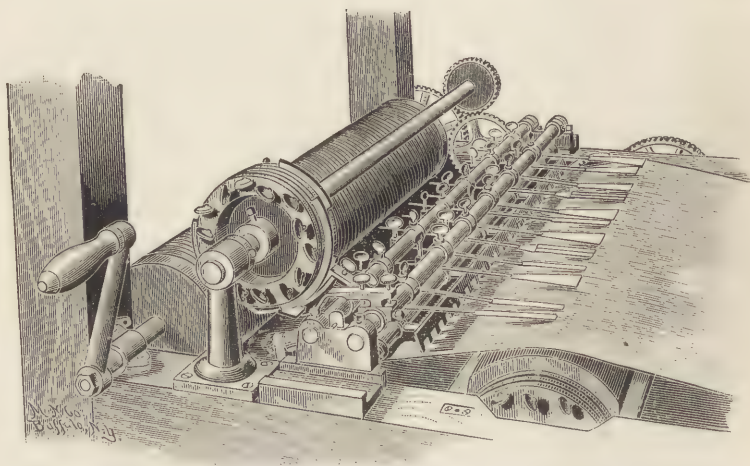
Another method of striking lines, and running others through in one beam at one operation, that is, when all pens drop at a head-line, some lifting at a foot-line, while others rule through, is to bend the pens which are to rule the continuous lines so that they touch the paper with sufficient pressure to rule during the time that the beam riding the cam has lifted the other pens. To enable the continuous pens to drop and lift, use higher cams; where the lines are to be continuous, use somewhat lower cams.

PEN OVER PEN.—Two or more distinct heads can be ruled and lifted at a foot-line with one operation by the

striker or underlift, by setting an extra-large pen on top of the regular pen. This can be done with either single or double pens, but in case of the latter, care must be taken to prevent ruling blind. A machine which is free from vibration and a clamp containing an extra layer of rubber between the jaws are all that are required for the successful execution of the pen-over-pen system of ruling. It can be done in the ordinary rubber-lined clamp if there are not too many pens in the pattern.

MANIFOLD UNDERLIFT.

Due to the number of heads and subheads in blanks and account books, to assure a greater degree of accuracy in striking, the underlift has found its place on the

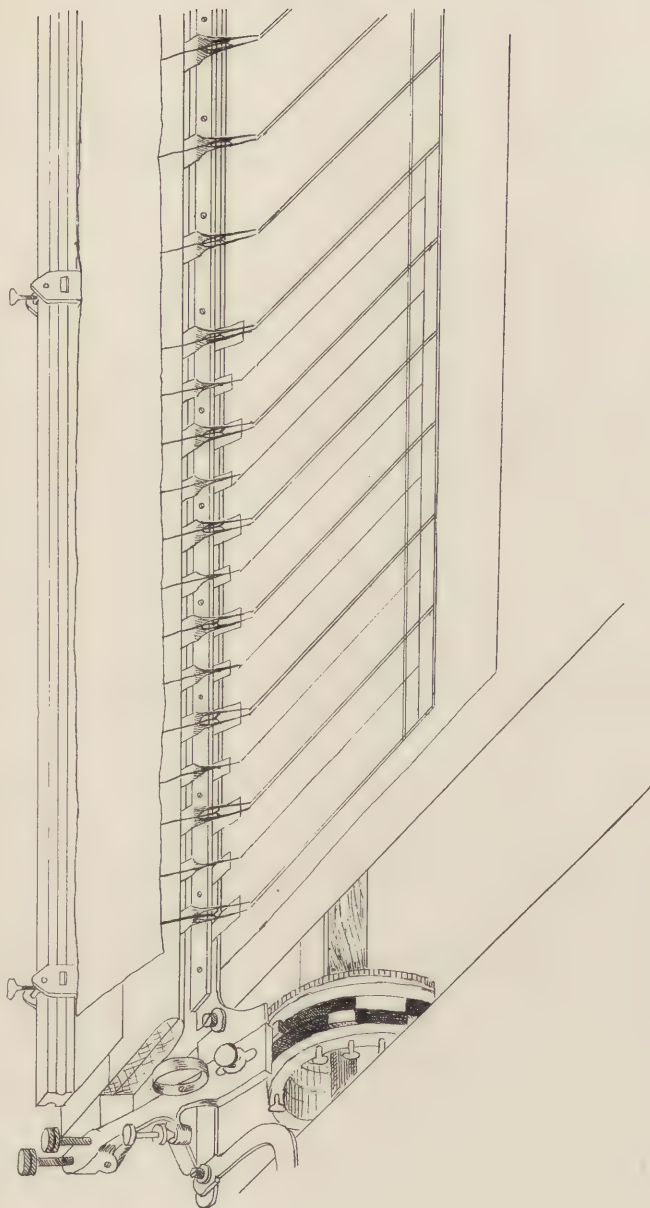


ruling machine. It was at first intended to take the place of the second beam, but since the advantages have become known, many establishments retain the second beam, thus giving three devices to strike and lift. This consists of two round shafts running across the machine over the gate bar, the boxes of these shafts being joined to

the shoes of the first-beam striker standards. These two beams have on them a number of dogs for holding the underlift spoons, which spoons extend over the gate bar and under the first striker beam, up to and just under the pens. These dogs and spoons are adjustable and can be moved to any pen or series of pens that are to be raised and lowered. The faces of the spoons are of different widths, so that they can raise and lower either single pens or a number, as is desired. The underlift cam head has four slots and two complete sets of 6-inch cams. It is situated on a shaft held by upright standards which are joined to the striker standard shoes and which extends across the machine about 8 inches above the blanket. This permits the underlift and striker beam to be adjusted together or separately, as desired. The underlift cam-head shaft is driven by a train of gears which mesh into the gate-cam gear on the side of the machine opposite the ruler. On each of the two underlift bars on the end next to the ruler are placed the pen rests which rock these bars, which, in turn, raise and lower the spoons, and which again, in turn, raise and lower the pens as desired. Each pen rest works in connection with two of the slots in the cam head. These cams are set in the same manner as the striker cams. These underlifts are especially desirable when the striking is complicated. They, in connection with the first striker beam, will do practically the same amount of striking that three striker beams will do. That is, they will take the place of second and third beams, as each of the two underlift shafts has a distinct and separate set of cams to operate it.

For example, take a pattern sheet of ruling that has three separate and distinct sets of struck lines, each set dropping and lifting on different head or drop lines on the sheet. Feed the pattern sheet into the machine in the regular way and set the striker pens, etc., to take care of

the first set of struck lines. Then feed the paper on to where the second set of struck lines commences. Set this second set of pens in the clamp, each pen point corresponding to and touching the line it is to rule on the pattern. Then adjust the underlift spoons on one of the underlift bars by moving the spoons up to the points of this second set of pens, using the shape and width of spoons required, so that they will interfere with and touch no other pens but those in this second set. Then tighten these spoons to the dogs on this underlift bar by means of the thumb set-screws. Then tighten these dogs to this underlift bar by means of the other thumb set-screws on top of the dogs. When properly set, these spoons will not quite touch the pens they are to raise, and will either rest very lightly on the cloth, or, better, will just clear the cloth by a hair's breadth. Then set the cams that work in connection with the pen rest on this underlift bar, so that they will hold up this second set of pens until they reach this second head or drop-line in question. Then move this second sheet along by turning the machine by hand until the pens are to be raised from the pattern again and set other cams so that the spoons will be raised at this point. If this second set of pens is to be raised and dropped several times on the same sheet, set the cams accordingly, as is done when setting cams in the striker cam head. With the third set of pens proceed in the same manner as with the second set, but use the other underlift bar, other pen rest, and other set of cams: Feed a sheet through and rule; if all the struck lines do not drop and rise at the proper points, adjust the cams a trifle either way until they do. Unless a ruler has considerable experience, it is almost impossible to set striker or underlift cams at the first setting so the pens will drop and rise at the exact points desired.



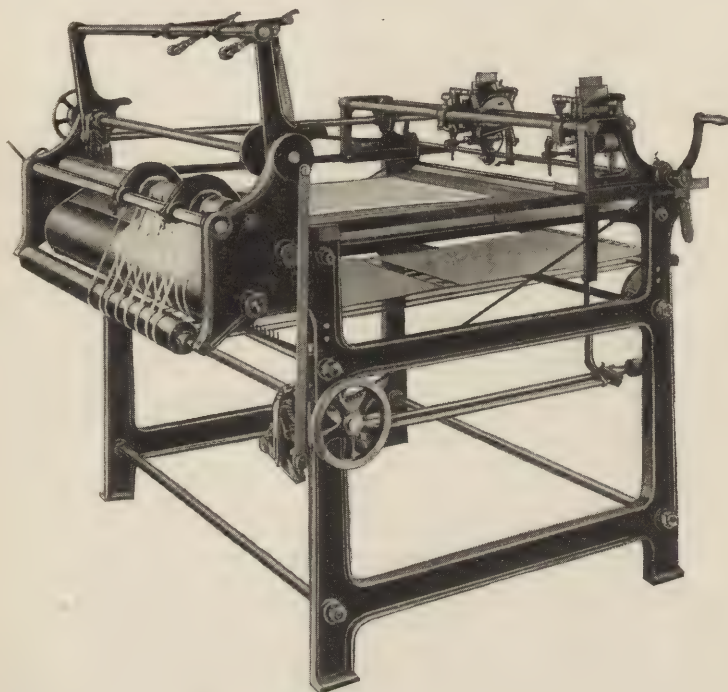
UNDERLIFT BAR.

This is a small, half-round bar with a flat piece of steel on top, forming a clamp to hold small pieces of brass or tin which are set beneath any number of the pens to raise and lower them as the bar rises and lowers, independently and separately from the rising and lowering of the striker beam and clamp. The standards of this bar are fastened to the base of the striker standards. Therefore, when the striker standards are adjusted or moved, the underlift bar moves and adjusts itself with them. This bar passes across the machine above the blanket, directly under the pens, and can be adjusted separately from the striker standards to and from the pens, as the ruling may require. In raising and lowering this bar, the regular two-slot, 8-inch cam head is used, only instead of the one set of regular 8-inch cams, two sets of sixty-two pieces each of 8-inch split cams are used. The bases of these split cams are only half the thickness of the regular cams and, therefore, two cams are used side by side in one slot of the cam head instead of using the two slots, as with the regular striker cams. The adjustments for the lifts and drops of the bar are made in the same way as with the striker cams, by sliding them back and forth for the different lengths of ruled lines required. The inside slot of the cam head is used for the cams that raise and lower the underlift-bar pen rest, while the outside slot is used for the cams that operate the regular striker pen rest. When an underlift bar is used in connection with a regular striker, a special striker pen rest must be used, the toe plate of which is only half the width of the regular pen rest, as it only has to work on the cams in one slot, instead of two, as the regular pen rest does. This bar is very advantageous in complicated striking, for an extra lift and drop can be obtained by its use at the same feeding, and it therefore does the work of an extra striking beam. The

pen rest of the bar should be set so that it will raise the points of the pen only about $\frac{1}{8}$ inch or less if possible, as bending the pens up and down too far does them no good.

RULING-MACHINE FEEDER.

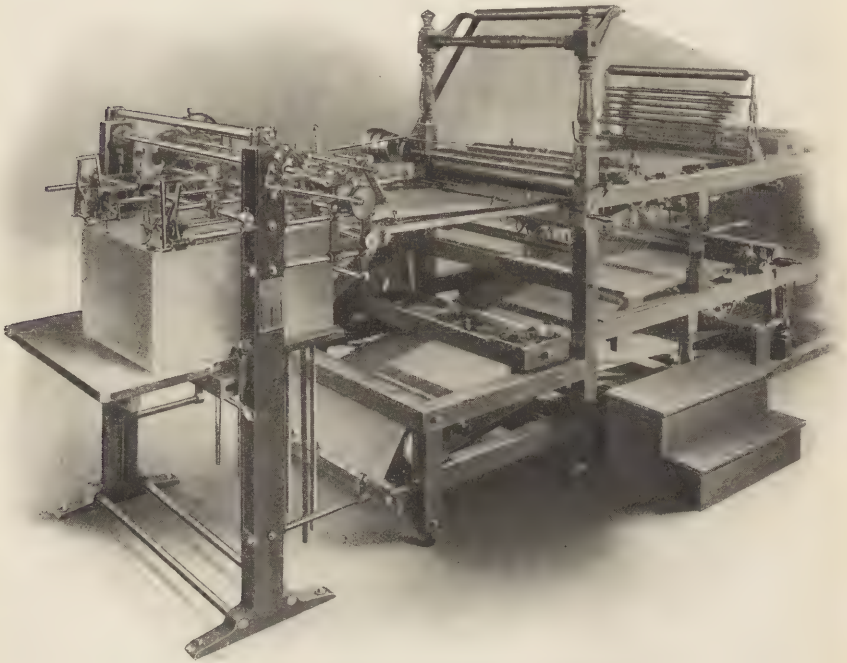
The unprecise feeding of the paper is done in most establishments by women instead of by machines. This



Funk Feeding Machine Co., Hoboken, N. J.

irregular expensive hand operation has been recently eradicated by the invention of a feeding machine for small runs. This machine increases the ruling production to a marvelous extent because of its untiring energy and regularity, which can keep pace with the ruling

machine. It is backed up to any standard pen ruling machine, and the sheet is fed away from it around the cylinder. The cylinder is the same size as the wooden one on the ruling machine by which the blanket of the ruling machine is driven. This arrangement permits of the piling of 6 inches of paper on the feedboard. The side guide is on the side toward the operator. Each



Fuller Ruling Machine Feeder, E. C. Fuller Co.

sheet is brought up against the side guide by twisted tapes and flags.

The starting and stopping of the machine are independent of the ruling machine, being done by moving a small lever, which is within reach of the ruling-machine operator when watching his pens. The adjustments from



Dexter Ruling Machine Feeder.

one size to another can be made in a minute. It will feed any grade of paper without change or adjustment to the last sheet on the board.

To reload, turn a crank. This will run both separating heads back out of the way of the paper. Then raise the shaft to get the pusher-fingers out of the way. The feeding board will then be entirely uncovered. Then grasp the hand-wheel, and, by releasing a small lever, the table is dropped; for different widths of sheets, slide the head along the supporting shaft.

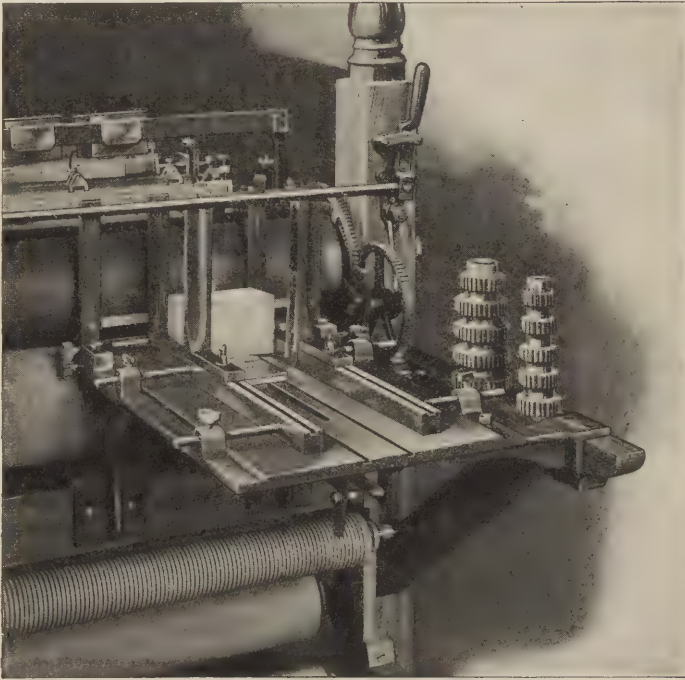
Other automatic feeders which greatly increase the output and insure accurate feeding and register are the Fuller and Dexter pile feeders. These machines can be attached to any ruling machine, either pen or disc, and require little attention when once adjusted and in operation. The adjustments are simple and easily made. On long runs of faint-line work where it is desirable to close up the space between the sheets on the blanket, a special device may be had. This, however, is of no advantage when using striker, as the exact turning of the sheets for the gate is obtained by gears. When used on faint-line work it obviates the necessity of changing gears for different sizes. From fifteen to thirty reams of paper may be loaded on the feeder at one time, depending on the thickness of the paper and height of the machine.

Other feeding machines are fully described in Part Two, and include continuous feeders, which effect a considerable saving of time on large runs.

CARD FEEDER.—This feeder will feed cards 3 by 3 inches to 10 by 10 inches as rapidly as desired. It will feed for down-lining accurately to the striker gate. Standard striker gears are for cards 3 by 5 inches, 4 by 6 inches, and 5 by 8 inches.

SPEED OF MACHINE.

There can be no fixed rule as to the speed of ruling machines because too much depends on climatic conditions, intricacy of the pattern, size and quality of the paper. Some people are of the opinion that the smaller the sheet, the greater the quantity which can be fed into



Hickok Card-feeding Device.

the machine. This is erroneous, as small sheets are awkward to handle, and greater care is required to feed them straight. Speed in feeding is largely dependent upon convenient sizes of paper. In some localities, where a damp atmosphere prevails, the speed of the machine is retarded. To overcome this a gas heater to dry the

FRANKLIN INSTITUTE
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ink is attached to the machine, usually over the apron near the lay-boy. This consists of a pipe with a number of holes drilled its entire length, above which is a shield to protect the cords and blanket from catching fire.

Pens should not be opened up so wide as to permit too free a flow of ink, as better results are obtained by pinching the pen close together and using a darker shade of ink. This permits the machine to run faster than with the wide-open pens.

Sheets 17 by 22 inches, twenty or twenty-four pounds, with ordinary ruling and dry atmosphere, five reams an hour can be averaged with swift and frequent changes of feeders. Sheets 28 by 17 inches, double cap, fed the 17-inch way in the machine, with the same pattern, would average not more than four per hour. Double cap, fed through the long way, with a simple pattern, would average about three reams per hour. Double demy, the 32-inch way, would average a trifle less.

Bond paper can not be ruled at the same speed as flats, because of the hardness of the paper.

Ledger paper, because of the cost, is ruled with greater care and, consequently, more slowly than flats and manilas used for blanks, bills and letter-heads.

A pattern with heavy colors, like purple, blue and green, requires a little longer time to dry, and in such cases the output is diminished.

ELECTRICITY.

Under certain conditions, pressmen and rulers have experienced considerable trouble with electricity, which is generated in the paper during its manufacture and remains while stored in bulk until dissipated or released. In small lots of paper the trouble is not as pronounced as in large lots. The friction incidental to the handling of the sheets and the rotary motion of the press and ruling machine add to the static electricity. This causes the sheets to stick together, adhere to the feedboard, and

STUTTER BLANK

AND BOARD

give trouble in delivery. It also causes offsets when the paper is printed, and subsequently the sheets stick together when fed into the folding machine.

It is the experience of rulers in some localities that on cold, dry, wintry days the friction caused by the passing of the blanket over the segment board charges the machine with electricity. Consequently, the sheets, instead of being carried by the lower cords to the apron, follow the upper cords or blanket. This trouble is so pronounced that as soon as the machine is started, to touch any of the steel parts gives a shock; besides, it draws the ink from the pens. Under such conditions it is difficult to stop the double or triple pens from running blind.

Weather conditions are largely responsible for this trouble. The cold, dry atmosphere of the winter makes it more difficult to get rid of the electricity than in the moist air of the summer. Various methods to eliminate this trouble have been devised, but have not proven successful under all conditions. To draw the electricity, copper wires are sometimes placed against the bed cylinder and delivery table of printing presses and run into the ground. On the ruling machine the wire is placed above the feed table across the machine and back of the beam. Equal parts of glycerine, wood alcohol and raw linseed oil rubbed on the draw-sheet, packing and feed tables, and segment board, are sometimes efficacious in eliminating friction and attracting and holding moisture, which offsets the static electricity.

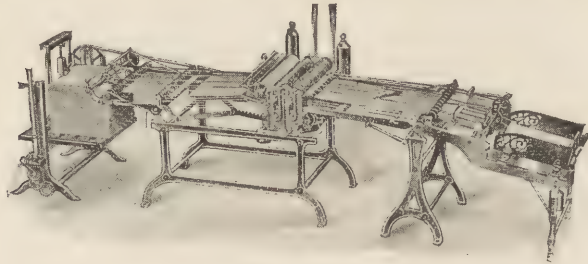
In addition to the above, two or three cords should be put around the ruling machine to hold the sheets in place until they pass to the apron. This will prevent the "dog-earing" of the corners, which frequently happens when ruling paper that does not absorb the ink as fast as the speed of the machine requires. To do this, feed the end of the thread, which is attached to a pin stuck in the blanket, into the machine until it reaches the

lower cords; then remove the pin, and follow the lower cords with the thread to the apron. Pass the thread around the blotter-covered roller, around the apron roller near the lay-boy, and to the apron-adjusting roller; then tie the ends together.

A gas heater, consisting of a pipe in which holes are drilled the entire length, and a shield to protect the cords and blankets, attached above the apron near the lay-boy, is, likewise, an efficacious remedy.

DISC RULING MACHINE.

The disc ruling machine has been on the market for a number of years and, unlike the pen machine, it is built of steel and brass. It is a rotary machine, built to rule on both sides with one feed. It is capable of producing a high standard of quality, but for intricate work in which a number of lines of different lengths appear on

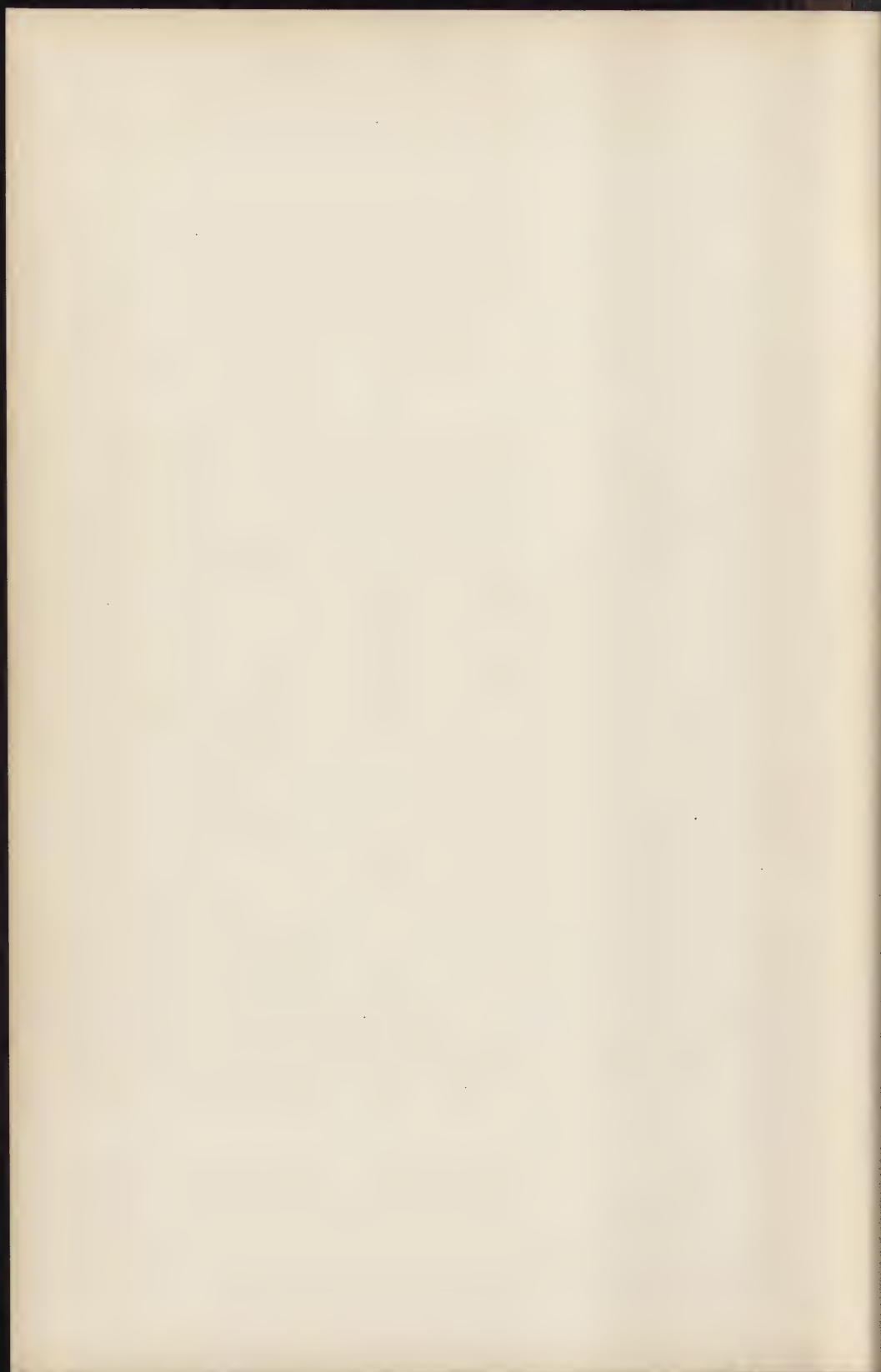


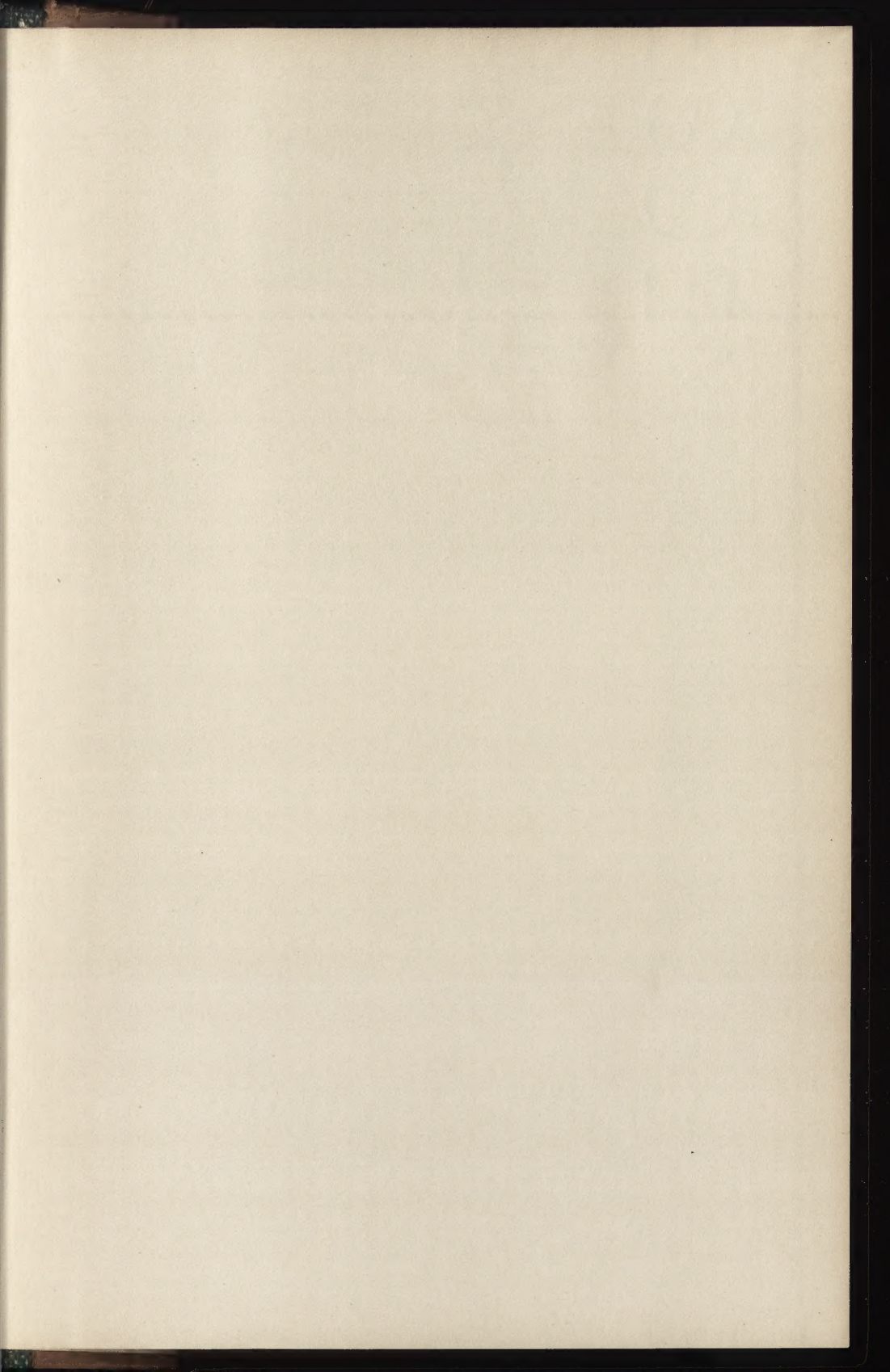
McAdams Disc Ruling Machine.

a sheet, the pen machine excels. Any down pattern containing about thirty struck lines which are run from either one or two heads can be more economically executed on a disc machine. It is obvious that for intricate down-line striking, this machine can not compete with the pen machine. However, it will excel the pen machine in faint or horizontal ruling and for down-line or perpendicular ruling, provided they are of the straight-running order. The advantage is also with this machine in that no matter how many lines are put upon a sheet, or

the quality of the paper which is used, it will not be injured by dampness. This is due to the small quantity of ink taken from the discs, which enables the ink to dry before ruling another sheet. On glazed or spongy papers, this machine can not be outclassed.

The ruling on the McAdams disc machine is done by revolving discs and the patterns are set up on rollers. The ink-feed consists of a water-tight well. This is just below the rubber roller, in which flannels are placed and fastened to the pins to prevent slipping. A portion of the flannel is placed on the rubber feed-roller, and the discs, by reason of their being set so that their surfaces touch the roller, convey by constant revolution the ink from the roller to the paper. The paper passes between the rolls and is ruled on both sides. Changes are quickly made, without removing the discs from the rolls. Counting, perforating and slitting attachments can be supplied with these machines. The automatic feeder straightens the paper up to the guide as it passes on to the ruling discs, and is simple in construction and design. The speed of the machine is gauged according to the size of the paper, and can be made to average twelve reams of folio per hour.





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